Final Habitat Conservation Plan

MidAmerican Energy Company

Iowa Wind Energy Project Portfolio

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Acronyms and Abbreviations

%	percent
§	section
°	degree
2007 Draft Recovery Plan	*The Indiana Bat (Myotis sodalis) Draft Recovery Plan: First Revision*
2009 Eagle Rule	A final rule authorizing limited issuance of permits to take eagles
2016 Eagle Rule	A final rule revising the 2009 Eagle Rule
APLIC	Avian Power Line Interaction Committee
BBCS	Bird and Bat Conservation Strategy
BGEPA	Bald and Golden Eagle Protection Act
BO	Biological Opinion
C	Celsius
CBD	Center for Biological Diversity
C.F.R.	Code of Federal Regulation
cm	centimeter
DBH	diameter at breast height
DDT	dichloro-diphenyl-trichloroethane
DEIS	Draft Environmental Impact Statement
Eagle Act	Bald and Golden Eagle Protection Act
ECP	eagle conservation plan
ECPG	*Eagle Conservation Plan Guidance: Module 1 – Land-Based Wind Energy*
EIS	Environmental Impact Statement
EMU	eagle management unit
EoA	Evidence of Absence
ESA	Endangered Species Act
F	Fahrenheit
FAA	Federal Aviation Administration
FEA	Final Environmental Assessment
FEIS	Final Environmental Impact Statement
Fed. Reg.	Federal Register
ft	foot
GAP	Gap Analysis Program
GE	General Electric
ha	hectare
HCP	Habitat Conservation Plan
HCP Handbook	*Habitat Conservation Planning and Incidental Take Permit Processing Handbook* (2016)
HUC	Hydrologic Unit Code
ICC	Illinois Commerce Commission
IDNR	Iowa Department of Natural Resources
IEoA	Informed Evidence of Absence

IIHR	University of Iowa IIHR-Hydroscience and Engineering
INBA	Indiana bat
INHF	Iowa Natural Heritage Foundation
ITP	Incidental Take Permit
IUB	Iowa Utilities Board
km	kilometer
km^2	square kilometer
LAP	local area population
lb	pound
LBBA	little brown bat
m	meter
m/s	meters per second
MBTA	Migratory Bird Treaty Act
met	meteorological
mi^2	square mile
MidAmerican	MidAmerican Energy Company
MidAmerican Energy	MidAmerican Energy Company
MISO	Midcontinent Independent System Operator
mph	miles per hour
MW	megawatt
NEPA	National Environmental Policy Act
NERC	North American Electric Reliability Corporation
NLCD	National Land Cover Database
NLEB	northern long-eared bat
NMFS	National Marines Fisheries Service
NREL	National Renewable Energy Laboratory
NYSDEC	New York State Department of Environmental Conservation
O&M	Operations and Maintenance
OCRU	Ozark Central Recovery Unit
Pd	*Pseudogymnoascus destructans*
Permit	Incidental Take Permit
pers. comm.	personal communication
PGC	Pennsylvania Game Commission
Project	One of the 22 wind energy facilities in Iowa operated by MidAmerican Energy Company
SCADA	Supervisory Control and Data Acquisition
SCM	species composition method
SDPUC	South Dakota Public Utilities Commission
Service	U.S. Fish and Wildlife Service
State	State of Iowa
TRBA	tri-colored bat
U.S.	United States
U.S.C.	United States Code

USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
WEG	*Land-Based Wind Energy Guidelines*
Wind Energy Portfolio	Collectively, the 22 wind energy facilities in Iowa operated by MidAmerican Energy Company
WNS	white-nose syndrome

1.0 INTRODUCTION

1.1 Overview and Background

MidAmerican Energy Company (MidAmerican Energy or MidAmerican), currently operates 22 wind energy facilities (individually Project, and collectively Projects or Wind Energy Portfolio) totaling more than 4,040 megawatts (MW) of wind generation capacity in Iowa. MidAmerican has more wind-powered generation capacity than any other rate-regulated utility in the United States (U.S.; MidAmerican Energy 2015).

MidAmerican Energy has prepared this Habitat Conservation Plan (HCP) in support of an application for an Incidental Take Permit (ITP or Permit) for the Projects under Section 10(a)(1)(B) of the Endangered Species Act (ESA 1973; 16 U.S. Code [U.S.C.] Sections [§§] 1531-1544). This HCP was developed in accordance with the ESA (Section 10(a)(2)(A)) and Federal Regulation (50 Code of Federal Regulations [C.F.R.] §§ 17.22(b)(1), 17.32(b)(1)) and in accordance with the Bald and Golden Eagle Protection Act (BGEPA 1940; 16 U.S.C. § 668–668c, as amended) and its regulations (50 C.F.R § 22.26 and § 22.27), and the U.S. Fish and Wildlife Service's (USFWS or Service) *Eagle Conservation Plan Guidance: Module 1 – Land-Based Wind Energy* (ECPG; USFWS 2013a; 78 Federal Register [Fed. Reg.] 25,758 (2013)).

MidAmerican Energy began coordinating with the USFWS in February 2014 regarding the company's Wind Energy Portfolio in Iowa. In these initial meetings, MidAmerican shared biological information regarding the Projects and the parties discussed opportunities to collaborate on conservation programs. This coordination continued through a series of meetings, conference calls, and written exchanges that have occurred through development of the current HCP.

Early on in these initial discussions, the parties recognized the State of Iowa's (State) shared interest in a State-wide conservation planning effort. As a result, the USFWS, State, and MidAmerican began coordinating over the development of a programmatic conservation strategy for MidAmerican's Wind Energy Portfolio in Iowa, which could leverage a landscape-scale approach to the conservation of the Covered Species (the species addressed in this HCP; see Section 1.3) in Iowa. To support this effort, the State and MidAmerican agreed to jointly develop an ESA Section 6 grant application to support monitoring efforts and to enable development of a programmatic conservation plan. The ESA Section 6 grant application was filed with the USFWS in January 2015. The first ESA Section 6 grant application identified how the State and MidAmerican would collaborate to conduct bat studies near MidAmerican's Projects. The grant application also anticipated that MidAmerican would provide a portion of the funding, either direct or in-kind, to support these initial studies. The Phase I studies included acoustic surveys and radio tracking of captured bats to assess migration patterns and habitat preferences across the range of MidAmerican Projects. Preliminary results from Phase I of the grant-supported survey activities are discussed in Section 5.2.1.

In March 2016, MidAmerican coordinated with the State to develop and submit a second Section 6 grant application to the USFWS, which was awarded in September 2016. The planned Phase II studies are intended to provide additional information about the use and movement of the Covered Bat Species within Iowa. Phase II studies include expanding the search for potential bat hibernacula through the use of emergence acoustic surveys, land cover/landform analysis, and field searches, including investigating the use of canine searchers to identify potential hibernacula. Other activities include limited repeated acoustic monitoring, monitoring of potential hibernacula sites, including trained canine searches and thermal video monitoring, and active aerial radio telemetry bat migration tracking from summer to winter habitat. The grant was awarded to the State in September 2016 and will support the studies as described above that are ongoing from winter 2016-2017 through winter 2017-2018. As with the Phase I Section 6 grant, MidAmerican is providing the non-federal matching portion of the funding for the Phase II study effort. The 2017 Section 6 grant work builds on data collected from the 2016 studies. It is anticipated that the results of the 2017 studies will be incorporated into this HCP as appropriate and available between the release of the draft HCP notice and the final HCP.

In connection with the State's Section 6 grant applications, MidAmerican continued to meet with the USFWS to develop an monitoring protocol designed to collect environmental baseline data at each of the Projects. These discussions resulted in MidAmerican's commitment to undertake substantial monitoring efforts and an adaptive management program at its Projects. Baseline monitoring activities commenced in December 2014 for eagle and avian use and fatality monitoring. Bat fatality monitoring and distribution surveys began in spring 2015. In addition, the parties identified specific operational parameters at MidAmerican Projects that could be implemented in response to the baseline monitoring. These parameters, and other aspects of these studies, were outlined in a Biological Evaluation developed by MidAmerican (MidAmerican 2015) and submitted to the USFWS in support of the ESA Section 6 grant application.

In August 2015, the USFWS issued a Biological Opinion (BO; McPeek 2015) evaluating proposed grant issuance and interrelated/interdependent activities. This BO, developed through many interactions with MidAmerican and USFWS, contains terms and conditions for completing proposed monitoring studies and related analyses. These studies and analyses serve as the foundation for the conservation strategies contained in this HCP and are intended to provide detailed information concerning the operations and impacts of MidAmerican's operating Projects in Iowa. The studies, as well as the evaluation contained in the BO, have enabled MidAmerican to develop: (1) a comprehensive conservation strategy that is informed by the best available scientific information; (2) well-informed take estimates for Covered Species; (3) predictive models to inform the likely distribution of bird and bat fatalities around turbines that can be used to inform statistical analysis and develop monitoring studies; and (4) studies for northern long-eared bat (NLEB; *Myotis septentrionalis*) migration in Iowa that inform the biological evaluation of the proposed action. As part of the BO, USFWS issued an incidental take statement that permitted no more than 75 NLEB and 18 Indiana bat (INBA; *M. sodalis*) to be taken over the Section 6 grant period (fall 2015 through winter 2017).

Upon completion, MidAmerican will have invested nearly $20 million to facilitate development of the HCP. The MidAmerican HCP is unique given the considerable amount of site-specific scientific information developed to support it and the partnerships resulting from its development. These partnerships will enable implementation of a coordinated mitigation strategy in Iowa between the State, MidAmerican, the USFWS, and other stakeholders that will provide substantial conservation benefits for the Covered Species and other wildlife.

1.2 MidAmerican Wind Energy Portfolio

The 22 Projects are located in the following Iowa counties: Adair, Adams, Audubon, Buena Vista, Carroll, Cass, Crawford, Floyd, Grundy, Guthrie, Hamilton, Ida, Madison, Marshall, O'Brien, Pocahontas, Polk, Pottawattamie, Sac, Tama, Webster, and Wright (Figure 1.1).

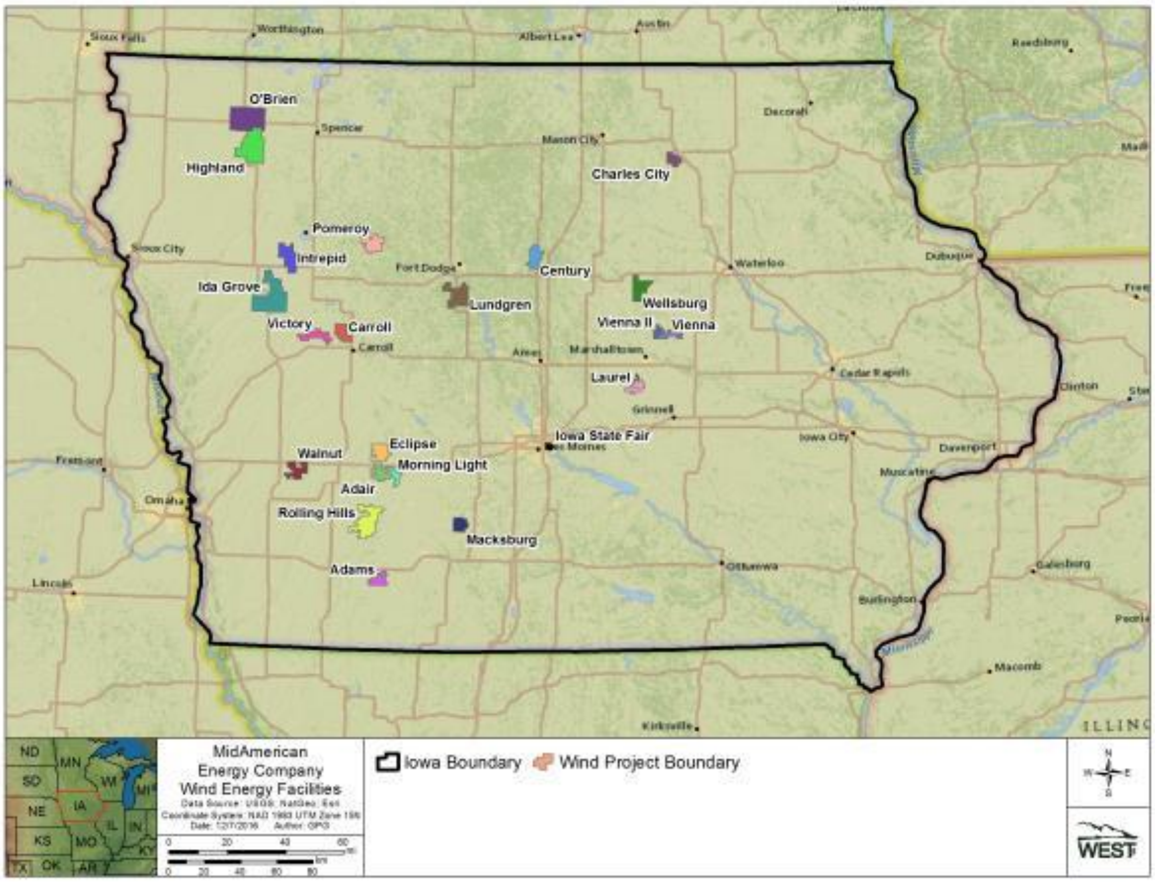

Figure 1.1. Location of the MidAmerican Energy Company Wind Energy Facilities.

1.2.1.1 Wind XI

In April 2016, MidAmerican Energy announced a major project that will provide a cleaner energy future for Iowa. The project is a significant step toward realizing MidAmerican's vision to provide 100% renewable energy for their Iowa customers on an annual basis. The project, Wind XI, was approved by the IUB in August 2016 and will add up to 1,000 wind turbines representing 2,000 MW of wind generation in Iowa across a number of additional wind farms. The $3.6-billion project is the largest wind project MidAmerican has ever undertaken, and it is being implemented without requesting an increase in customer rates or financial assistance from the State.

In January 2017, MidAmerican announced plans to build the first two Wind XI wind farms in Boone, Greene and Mahaska counties. MidAmerican began construction in April 2017 on the Beaver Creek Project in Boone and Greene counties and the Prairie Project in Mahaska County, with completion of both Projects scheduled for the end of 2017. The wind farms will add 338 MW of new wind generation capacity in Iowa: the Beaver Creek Project will consist of 85 turbines, which will add 170 MW of wind generation capacity, and the Prairie Project will have 84 turbines and add 168 MW of wind generation capacity.

MidAmerican Energy continues to work with developers, county officials and landowners at potential wind project sites in other Iowa counties for the balance of the Wind XI project. Construction on these projects would start in 2018 and 2019, and sites will be announced at a later date. Construction on the entire Wind XI project is expected to be completed by December 2019. With its investment in the Wind XI project, MidAmerican's annual wind generation will increase from approximately 57% to approximately be equal to 85% of the energy used by retail customers in Iowa on an annual basis, bringing MidAmerican within striking distance of their 100% renewable energy vision.

The NEPA scoping notice anticipated the ability for MidAmerican to tier future permitting efforts from the programmatic EIS and it is MidAmerican's intent to complete a separate HCP for the Wind XI and other potential future wind projects.

1.3 Purpose and Need

MidAmerican Energy's purpose for the Projects is to maximize the non-carbon emitting energy production, using reliable, low-cost wind, in support of the company's 100% renewables vision. The Projects contribute to the reduction in emissions from MidAmerican's generation fleet, which consists of coal- and natural gas-fueled generating units, as well as wind, nuclear, hydropower and other sources. MidAmerican anticipates that in 2017, when all 22 Projects are operational, carbon emissions will be approximately 1,000 pounds (lbs) of carbon dioxide per megawatt hour-net (lb/MWh-net), which is equivalent to an approximate 48% reduction in carbon intensity from 2002, prior to the completion of MidAmerican's first wind project. The Projects are estimated to bring MidAmerican to 57% renewable generation for its Iowa customers on an annual basis by the end of 2017.

The Projects also provide significant economic benefits to surrounding communities in the form of payments to landowners, local spending, and annual community investment. The development, construction and operation of each Project also generated as many as 975 jobs at the peak of construction and created 46 full-time, permanent jobs in each Project area. The Projects help provide energy security to the U.S. by diversifying the electricity generation portfolio, protecting against volatile natural gas price spikes, and utilizing a renewable, domestic source of energy.

MidAmerican has developed this HCP in support of its ITP application. There are two species of ESA-listed bats, INBA and NLEB, that occur in all or portions of Iowa. In addition, Iowa is within the range of bald eagle (*Haliaeetus leucocephalus*), a species protected under the BGEPA. It is also within the range of little brown bat (LBBA; *M. lucifugus*), a species the USFWS has been petitioned to emergency list under the ESA, and of tri-colored bat (TRBA; *Perimyotis subflavus*), which is also under consideration for listing. Based upon past and ongoing consultation with the USFWS, MidAmerican determined that obtaining an ITP for its Iowa Projects was prudent to ensure that operation of its Wind Energy Portfolio would not adversely impact these species and to provide a mechanism to implement conservation measures for listed and unlisted species in Iowa.

MidAmerican's needs for the HCP are to achieve regulatory certainty and take compliance under the ESA, obtain incidental take authorization for Covered Species across its entire wind energy fleet, and to achieve regulatory efficiency by covering both bats and bald eagles under one conservation plan and one National Environmental Policy Act (NEPA) review. Accordingly, the purposes of this HCP are to: (1) assess the impacts of the Projects on the Covered Species (INBA, NLEB, LBBA, TRBA, and bald eagle); (2) provide mechanisms to avoid, minimize, and mitigate to the maximum extent practicable the impacts of the taking of the Covered Species; and (3) ensure that incidental take from the Projects will not appreciably reduce the likelihood that the Covered Species will survive and recover in the wild. The HCP will also support conservation of other non-listed bat species through the proposed conservation measures that will minimize potential mortality and protect habitat suitable for all bat species. In addition, this HCP describes the monitoring that will be used to confirm compliance with the ITP. The HCP also identifies funding assurances to ensure implementation of monitoring, mitigation, and any Changed Circumstances. This HCP includes all elements necessary to meet the criteria for ITP issuance.

MidAmerican Energy also expects to develop additional wind energy projects in Iowa. As additional projects are developed, MidAmerican may work with the USFWS to incorporate the projects into this HCP through the amendment process (Section 8.4) or MidAmerican may develop an independent HCP or eagle conservation plan (ECP) to obtain incidental take coverage for the new Projects.

1.4 Permit Duration

MidAmerican Energy is seeking a 30-year ITP. This requested Permit term is sufficient to include the remaining operational life of each of the 22 Projects (Chapter 2). If, at the end of the 30-year term of the ITP, MidAmerican Energy decides to continue to operate any or all of the Projects, MidAmerican Energy has the option of Permit renewal (Section 8.5) or to apply for a new Permit.

1.5 Covered Lands

The lands considered within this HCP include the Plan Area and the Permit Area (Covered Lands).

1.5.1 Plan Area

The Plan Area is the geographic area where all activities covered by the HCP will occur (Figure 1.2). It includes any and all areas that may be within the HCP's sphere of influence, whether or not take is likely to occur in those areas. The Plan Area for the HCP includes the Permit Area (defined below), as well as all areas influenced by the HCP's biological goals and objectives, such as the mitigation, monitoring, and adaptive management measures associated with this HCP (Chapter 5). The Plan Area includes lands involved in off-site mitigation projects associated with this HCP, which are not likely to overlap with the Permit Area lands (Section 5.3). For the purposes of this HCP, the Plan Area is defined as the State, which is the total area where the HCP applies

(USFWS and National Marine Fisheries Service [NMFS] 2016; *Habitat Conservation Planning and Incidental Take Permit Processing Handbook* [HCP Handbook]; Figure 1.2).

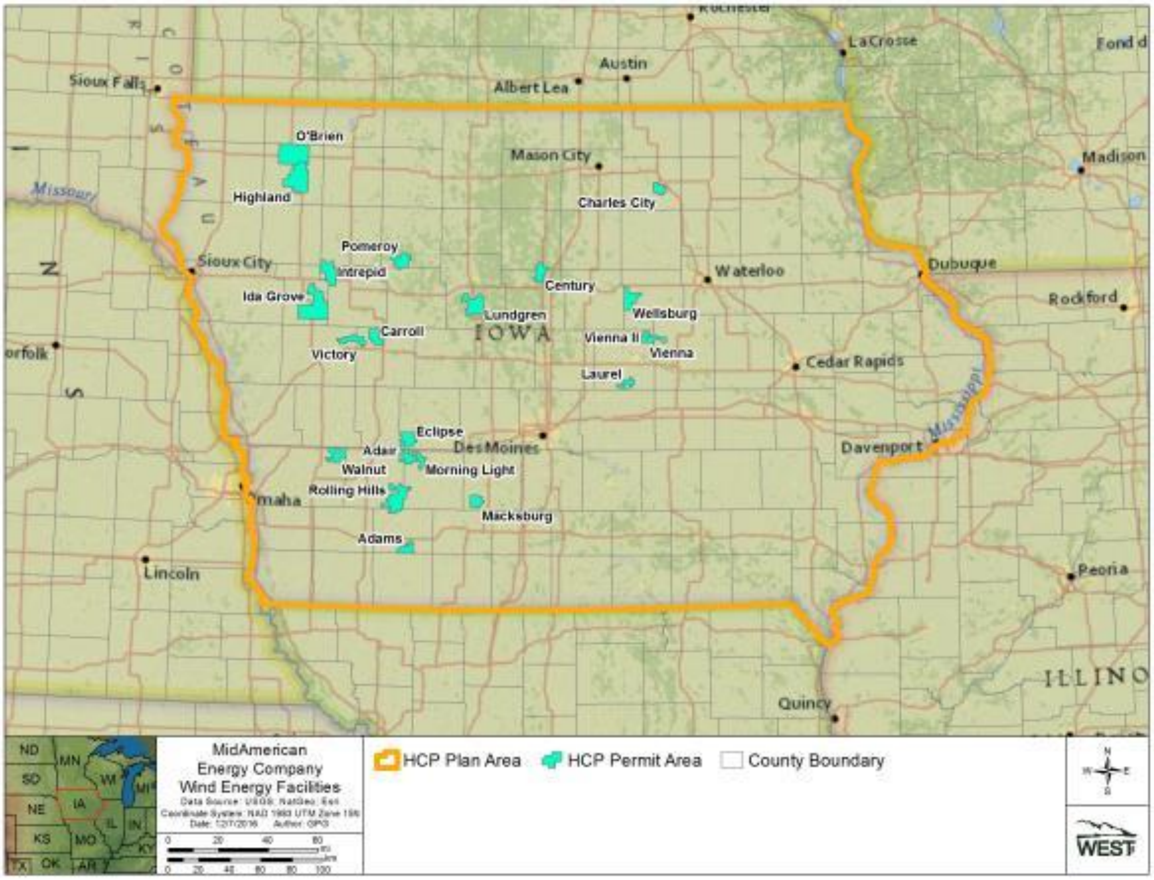

Figure 1.2. Location of the Plan Area and Permit Area for MidAmerican Energy Company's Habitat Conservation Plan.

1.5.2 Permit Area

The Permit Area is a subsection of the Plan Area and consists of all areas where incidental take of the Covered Species is expected to occur and which will be authorized by the ITP. MidAmerican Energy has determined that the Permit Area includes all easements, fee lands, and lands leased or owned by MidAmerican for operation of the 22 Projects, defined as the Project areas (Chapter 2). MidAmerican has authorization to conduct the activities required for construction, operation, maintenance, and decommissioning of the Projects within these lands, and the actions/activities that could lead to incidental take of the Covered Species within these lands. Project components including the turbines, underground electrical collection system, substations, operations and maintenance (O&M) facilities, and access roads are located within these lands. The primary components of the Projects that could cause take of the Covered Species are the wind turbines; the Permit Area includes the location of all turbines (see Chapter 2).

The total area under lease for all the Projects combined covers approximately 210,411 hectares (ha; 519,937 acres). More detailed descriptions of the Projects and Permit Area can be found in Sections 2.1 and 2.2.

1.6 Covered Species

MidAmerican Energy is applying for an ITP for INBA, NLEB, LBBA, TRBA, and bald eagle for incidental take resulting from the Covered Activities (see Section 2.2). The INBA is listed as endangered under the ESA (USFWS 1967, 2007a, 2015a, 2015b). The bald eagle was delisted from the Federal List of Endangered and Threatened Wildlife under the ESA in the lower 48 states in 2007 (USFWS 2007b; 72 Fed. Reg. 37,346 (2007)) but is still protected under BGEPA (16 U.S.C. § 668). Although the NLEB is currently listed as threatened under the ESA (USFWS 2015c; 80 Fed. Reg. 17,934 (2015)), the final 4(d) Rule for the species published January 14, 2016 (81 Fed. Reg. 1,900 (2016); USFWS 2016a), exempts from ESA Section 9 take prohibitions the incidental take of NLEB resulting from most otherwise lawful activities, including incidental take due to the operation of wind turbines. NLEB is included in this HCP as a Covered Species so that the species is addressed in the event the 4(d) Rule is reversed or the species is up-listed to "endangered" within the term of the Permit.

In addition, LBBA and TRBA, currently non-listed species, are included in this HCP as Covered Species so that each is addressed in the event that it is listed within the term of the Permit. During the 1982 amendments to the ESA, Congress considered treatment of non-ESA-listed species and clearly intended that the Section 10 process would provide for conservation of listed and non-listed species and protect Section 10 permittees from the uncertainties of future species listings (H.R. Report No. 97-835, 97th Congress, Second Session; 50 Fed. Reg. 39,681 (1985)). Chapter 7 HCP Handbook (USFWS and NMFS 2016) describes treatment of unlisted species in HCPs. If an unlisted species is "adequately covered" under an HCP as if it was listed pursuant to Section 4 of the ESA, with the HCP measures for the species satisfying permit issuance criteria under ESA Section 10(a)1(B)) and the measures described in the HCP for conservation of the unlisted species are implemented consistent with the HCP, then in the event the species is listed the permittee will be in full ESA compliance for the species, the No Surprises Assurances will apply (see Section 8.1), and no further action will be required of the permittee.

The potential future listing of additional bird or bat species currently unknown that could be taken by the Covered Activities is considered a Changed Circumstance and is addressed below in Section 8.2 of this HCP.

1.7 Regulatory Environment

1.7.1 Endangered Species Act

Section 9 of the ESA prohibits the "take" of any endangered or threatened species of fish or wildlife listed under the ESA. Under the ESA, the term "take" means to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect species listed as endangered or threatened or to attempt to engage in any such conduct (16 U.S.C. § 1532(19)). Under Section 10 of the ESA, the USFWS may authorize, under certain terms and conditions, any taking otherwise prohibited by Section 9(a)(1)(B) if such taking is incidental to, and not the purpose of, an otherwise lawful activity. This Section 10 take authorization is known as an ITP.

Harass in the definition of "take" in the ESA means an intentional or negligent act or omission that creates the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns that include, but are not limited to, breeding, feeding, or sheltering (50 C.F.R. § 17.3). Harm in the definition of take in the ESA means an act that actually kills or injures wildlife (50 C.F.R. § 17.3). Such acts may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering.

To qualify for an ITP, a non-federal landowner or land manager must develop, fund, and implement a USFWS-approved HCP. The HCP must specify the following information described in ESA Section 10(a)(2)(A) and 50 C.F.R. §§ 17.22(b)(1) and 17.32(b)(1):

1. The impact that will likely result from such taking;

2. The measures the applicant will undertake to monitor, minimize, and mitigate such impacts, the funding that will be available to implement such measures, and the procedures to be used to deal with Unforeseen Circumstances;

3. The alternative actions the applicant considered that would not result in take and the reasons why such alternatives are not proposed to be utilized; and

4. Such other measures that the Director of the USFWS may require as necessary or appropriate for purposes of the HCP.

The USFWS will issue an ITP if it finds that the following criteria of ESA Section 10(a)(1)(B) and 50 C.F.R. §§ 17.22(b)(2) and 17.32(b)(2) are met:

1. The taking will be incidental to otherwise lawful activities;

2. The applicant will, to the maximum extent practicable, minimize and mitigate the impacts of such takings;

3. The applicant will ensure that adequate funding for the HCP and procedures to deal with Unforeseen Circumstances will be provided;

4. The taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild;

5. The applicant has met the measures, if any, required by the Director of the USFWS as being necessary or appropriate for the purposes of the plan; and

6. The Director of the USFWS has received such other assurances, as he or she may require, that the plan will be implemented.

1.7.2 Bald and Golden Eagle Protection Act

The BGEPA (or Eagle Act) (16 U.S.C. §§ 668-668d) prohibits the take of bald and golden (*Aquila chrysaetos*) eagles unless authorized pursuant to regulations. The Eagle Act defines eagle take to include a broad range of actions, including to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb an eagle. The term "disturb" as defined in 50 C.F.R. § 22.3 includes agitating or bothering an eagle to a degree that it causes, or is likely to cause, based on the best scientific information available: (1) injury to an eagle; (2) a decrease in its productivity by substantially interfering with normal breeding, feeding, or sheltering behavior; or (3) nest abandonment by substantially interfering with normal breeding, feeding, or sheltering behavior.

In 2008, the USFWS issued a rule allowing ESA incidental take permits to cover eagles. In that rulemaking, the USFWS stated that if an ITP is conditioned in accordance with BGEPA standards, then the ITP also conveys take authorization under BGEPA. "The statutory and regulatory criteria for issuing those ESA authorizations included minimization, mitigation, or other conservation measures that also satisfied the statutory mandate under the Eagle Act that authorized take must be compatible with the preservation of the bald or golden eagle." 73 Fed. Reg. 29,075 (2008) (USFWS 2008). USFWS regulation, 50 C.F.R. § 22.11, provides:

> A permit that covers take of bald eagles or golden eagles under 50 C.F.R. Part 17 for purposes of providing prospective or current ESA authorization constitutes a valid permit issued under this part for any take authorized under the permit issued under Part 17 as long as the permittee is in full compliance with the terms and conditions of the permit issued under Part 17. The provisions of Part 17 that originally applied will apply for purposes of the Eagle Act authorization, except that the criterion for revocation of the permit is that the activity is incompatible with the preservation of the bald eagle or the golden eagle rather than inconsistent with the criterion set forth in 16 U.S.C. § 1539(a)(2)(B)(iv).

In 2009, the USFWS published a final rule (2009 Eagle Rule) authorizing limited issuance of permits to take bald eagles and golden eagles (74 Fed. Reg. 46,836 (2009); 50 C.F.R. § 22.26; USFWS 2009a). A permit would authorize eagle take for interests in any particular locality provided: (a) take is not the purpose of the interest, and (b) take is compatible with the preservation of the bald or golden eagle. The USFWS defined the preservation standard to mean "consistent with the goal of stable or increasing breeding populations." 74 Fed. Reg. at 46,837.

In 2013, the USFWS published the ECPG (USFWS 2013a), which explains the USFWS' approach to issuing and guidance to obtain permits under the 2009 Eagle Rule for incidental take on an individual or programmatic basis. The ECPG is intended to be implemented in conjunction with other actions recommended in the *Land-Based Wind Energy Guidelines* (WEG; USFWS 2012a) that assess impacts to wildlife species and their habitats.

In 2016, the USFWS issued a final rule revising the 2009 Eagle Rule (2016 Eagle Rule). 81 Fed. Reg. 91,494 (2016) (USFWS 2016b). In the 2016 Eagle Rule, the USFWS revised its interpretation of the BGEPA preservation standard to mean "consistent with the goals of maintaining stable or increasing breeding populations in all eagle management units [EMU] and the persistence of local populations throughout the geographic range of each species." 81 Fed. Reg. at 91,498. The USFWS noted that the 2016 Eagle Rule accounts for persistence of local eagle populations "by generally requiring compensatory mitigation for cumulative authorized take exceeding 5% of the" local area population (LAP); except where "the EMU take limit is not exceeded (i.e., currently the case for bald eagles in all EMUs), the permitted take is already occurring, and the permit conditions would result in a reduction of take." 81 Fed. Reg. at 91,504.

The 2016 Eagle Rule also clarified that applicants who submit an ESA Section 10 application, which includes eagle take coverage within six months of January 17, 2017 (the effective date of the 2016 Eagle Rule) may choose whether the standards of 50 C.F.R. § 22.26 that were in place prior to that effective date will apply to their permits or the standards of the final revised regulations. 81 Fed. Reg. at 91,538.

In accordance with USFWS regulations and guidance, the ECPG and the WEG, MidAmerican is addressing take of and mitigation for bald eagles across its Projects in this HCP rather than developing separate ECPs for eagle take permits. In addition, MidAmerican demonstrates through this HCP that it will satisfy requirements for eagle take authorization under the 2009 Eagle Rule and the 2016 Eagle Rule. In particular, and as discussed in greater detail throughout this HCP, MidAmerican: (a) has developed this HCP consistent with the ECPG; (b) has coordinated closely with the USFWS in developing and conducting bald eagle surveys for the Projects; (c) has coordinated closely with the USFWS in evaluating the risk to bald eagles from operation of the Projects; (d) will reduce eagle take to a level that is practicably unavoidable; and (e) will commit to compensatory mitigation for all bald eagle take, even if take does not exceed the 5% LAP threshold for cumulative authorized take.

To avoid and minimize impacts to species protected by the Migratory Bird Treaty Act, including eagles, MidAmerican has developed a Bird and Bat Conservation Strategy (BBCS) that incorporates applicable measures based in part on the USFWS *Interim Guidelines to Avoid and Minimize Wildlife Impacts from Wind Turbines* (USFWS 2003) and the WEG (USFWS 2012a). Collectively, these recommendations contain materials to assist in evaluating possible wind power sites, wind turbine design and location, pre- and post-construction research to identify or assess potential impacts to wildlife, and potential minimization and mitigation measures. MidAmerican's BBCS was submitted to USFWS for its consideration and review and appended by the USFWS to the Draft Environmental Impact Statement (DEIS). The BBCS is a living document that is currently being implemented and is updated periodically as MidAmerican expands its wind energy generation portfolio and as MidAmerican responds to changing circumstances. The DEIS will analyze migratory bird impacts, including the contributions of conservation measures that appear in MidAmerican's BBCS.

1.7.3 National Environmental Policy Act

Issuance of an ITP is a federal action subject to compliance with NEPA (42 U.S.C. §§ 4321 et seq.) and Council on Environmental Quality regulations implementing NEPA (40 C.F.R. §§ 1500-15081). To comply with NEPA, before issuing an ITP, the USFWS must take a "hard look" at the effects of issuing the permit on the human environment. The USFWS has determined that preparation of an Environmental Impact Statement (EIS) is appropriate to satisfy its obligation under NEPA to determine the significance of environmental impacts associated with issuance of an ITP in response to MidAmerican's HCP. The EIS involves a detailed evaluation of the effects of the federal action on the human environment and includes analysis of a reasonable range of alternatives to the federal action.

In addition to evaluating environmental impacts of a proposed federal action, NEPA established a framework for public involvement in these reviews. Public involvement begins with the scoping process, intended to help identify issues that should be addressed in the EIS. Through the scoping process, the USFWS solicited input from other federal, state, and local agencies, as well as from other interested parties (e.g., general public, non-governmental organizations) regarding the scope of the EIS and the range of reasonable alternatives.

The USFWS used several media sources to notify the public and potentially interested parties to provide them with the opportunity to participate in the scoping process, including email, direct-mail postcards, publication of a notice in the Fed. Reg., and development of a website for the EIS. To support distribution of the Notice of Intent and notice of the public meeting, these documents and meeting information were posted on the USFWS' website at the following link: https://www.fws.gov/midwest/rockisland/te/ MidAmericanHCP.html. The USFWS' formal scoping process began with the publication in the Fed. Reg. of a *Notice of Intent for Preparation of an Environmental Impact Statement for Issuance of an Incidental Take Permit* (81 Fed. Reg. 25,414 (2016); USFWS 2016c). The USFWS website for the MidAmerican Wind HCP is also used to facilitate public knowledge and participation through the dissemination of information regarding the Project's status, history, and planned future activities.

The notice provided information about:

1. The Project and the EIS;

2. Species proposed for inclusion in the HCP (note, TRBA was added to the HCP in response to comments on the scoping notice); and

3. The specific location, date, and time of the public scoping meeting; how comments could be mailed, faxed, or e-mailed to the USFWS; and contact information for the key USFWS representative to request further information from (their name, address, and telephone number).

Persons needing reasonable accommodations in order to attend and participate in the scoping meeting were asked to contact the USFWS a minimum of one week in advance of the meeting such that appropriate arrangements could be made. The USFWS received no such requests.

1.7.4 Regulation of Electric Utilities

1.7.4.1 Rate Regulation over MidAmerican's Wind Projects

MidAmerican is a rate-regulated utility, meaning that its retail customer rates and service quality are regulated by the Iowa Utilities Board (IUB), the Illinois Commerce Commission (ICC) and the

South Dakota Public Utilities Commission (SDPUC). Since all of MidAmerican's wind energy facilities are located in Iowa, the company has sought and received from the IUB approval of the rate principles that will apply in the event the Projects are part of a future rate case.[1] A small portion of MidAmerican's generation resources, including wind generation, are allocated to MidAmerican's South Dakota customers pursuant to orders of the SDPUC. Pursuant to orders of the ICC, however, MidAmerican's Illinois customers are not included in the allocation of MidAmerican's wind energy generation portfolio. The IUB approved the rate principles for each of MidAmerican's wind projects, finding that the Projects will provide MidAmerican's customers with low-cost, reliable and renewable energy resources and will support the transition away from traditional generation resources that have increased environmental impacts.

MidAmerican has pursued wind projects that allow the Company to develop, construct, and operate the Projects in order to deliver renewable energy within the cost cap approved by the IUB and at no net cost to customers; in other words, MidAmerican does not require an increase in electric rates in order to build and operate its wind Projects. To date, MidAmerican has applied for advanced ratemaking principles for all of its new wind projects (Iowa Code Chapter 476.53). These principles establish the rate structure for the wind projects when they are formally included in rates via an electric rate case. Each application for ratemaking principles must address various factors, including: cost, cost robustness, environmental reasonableness, system reliability, economic development, geopolitical uncertainty, flexibility/optionality, diversity/generation mix, and resource availability/stability. The resulting ratemaking principles issued by the IUB address issues such as project size cap, project cost cap, and return on equity.

In order for expenses to be recovered by MidAmerican in a rate case, such expenses must be reasonable and prudently incurred by the company (Iowa Code Chapter 476). While costs that are under the cost cap approved as advanced ratemaking principles must be included in rates, any costs in excess of the established cost cap are reviewed by the IUB to assess the reasonableness and prudence of any such costs. MidAmerican evaluates all expenditures to ensure they remain below the cost cap to keep the costs low for customers. To date, MidAmerican has not exceeded any cost cap established by the IUB, and thus has succeeded in providing these renewable resources to customers at no net cost. The company is proud of this accomplishment, and the purpose and need for this HCP is tied to MidAmerican's goal to continue to construct and operate its renewable energy developments at no net cost to customers while providing reliable, environmentally responsible energy to its customers.

In the case of environmental measures addressed in an advanced ratemaking principles application, such as ESA compliance, MidAmerican must evaluate available scientific information and determine what measures are reasonable and prudent to implement to avoid, minimize, and mitigate the take of listed species. Costs that are unnecessary or excessive and not reasonably connected to avoiding, minimizing, or mitigating take of listed species based on the best available data may not be considered reasonable or prudent.

Key to MidAmerican's goal of providing low-cost, reliable, renewable energy is the need for wind generation resources to be built and operated in an environmentally responsible manner while

[1] *See* RPU-2003-0001; RPU-2004-0003; RPU-2005-0004; RPU-2007-0002; RPU-2008-0002; RPU-2008-0004; RPU-2009-0003; RPU-2013-0003; RPU-2014-0002; RPU-2015-0002; and RPU-2016-0001.

maximizing the wind generation resources during key periods of the year when energy demands are relatively high, so as to avoid the need to rely on traditional generation resources. For example, this HCP will fully offset any impacts to the Covered Species by making operational changes to minimize impacts and by mitigating any remaining impacts through land and habitat conservation. The combination of minimization and mitigation described in Section 5.3 fully offsets the impacts of the taking while maximizing the output of renewable energy from the Projects. Further reducing the renewable energy output by expanding the proposed operational changes by Project, timing or duration would not increase the biological benefit to the Covered Species because the expected reduction in take of the Covered Bat Species is small when compared to the expected gain in bat conservation through the mitigation. MidAmerican believes this HCP strikes the right balance between its responsibilities to its customers and the IUB, and a robust approach to achieving compliance with the ESA and BGEPA.

1.7.4.2 Electric Reliability Requirements

MidAmerican Energy is a member of the Midcontinent Independent System Operator, Inc. (MISO), a reliability coordinator designated by the North American Electric Corporation (NERC). MISO has authority to dispatch all of MidAmerican's generation, wind and non-wind. MISO and the IUB are also responsible for determining the amount of generation capacity that MidAmerican must have to reliably serve its customers, which includes having a "reserve margin" of additional capacity to account for times when capacity will not be available (because of maintenance or weather). MidAmerican's generation must be available at certain times and must have the capability to respond to requests from MISO for generation, including requirements to increase or decrease generation output.

In addition, all of MidAmerican's Projects are part of the bulk electric system, as defined by the NERC; NERC has been designated by the Federal Energy Regulatory Commission as the responsible electric reliability organization under the Energy Policy Act of 2005. As a result, MidAmerican must comply with mandatory NERC standards, which include but are not limited to, providing capacity, energy, frequency response, voltage regulation and other emergency service to the bulk electric system. These reliability requirements serve as an additional consideration on the operation of the wind projects. For example, MidAmerican must ensure that constructed, operating wind projects and other generation assets are able to respond to calls for power from MISO in a specified timeframe. This consideration further influences the manner and amount that MidAmerican is able to curtail or constrain operations of its generation assets, including its wind projects.

2.0 PROJECT DESCRIPTION AND COVERED ACTIVITIES

2.1 Project Description

MidAmerican Energy began building wind energy facilities in 2003. Commensurate with the company's Environmental Respect policy, industry best practices and USFWS and IDNR guidance in place at the time each Project was developed and constructed, MidAmerican selected Projects that avoided or minimized impacts to streams and wetlands, cultural resources, and threatened and endangered species and their habitats. MidAmerican continued to add to its wind energy generation portfolio, with additional buildout from 2005 through 2009, and again from 2011 through 2016. As the USFWS' wind energy guidance evolved over time, MidAmerican incorporated additional best practices into its wind development program, including the development and implementation of avian management procedures, including incidental wildlife discovery reporting, beginning in 2010. The incidental wildlife discovery program was implemented by site wide policies that directed wind O&M technicians to conduct a search of the immediate viewable area near the gravel pad at the base of each turbine upon arrival at every turbine visit for routine or unplanned maintenance activities.

MidAmerican Energy currently operates 22 Projects in Iowa (Table 2.1), consisting of 2,020 turbines that vary by type and Project (Table 2.2). The Projects are operated locally from the control room in the O&M buildings and remotely from Des Moines, Iowa, through a remote operations control center. All O&M activities are conducted and supported by a permanent staff typically of 10 to 15 on-site personnel at each Project. Each turbine has a supervisory, control and data acquisition (SCADA) operations and communications system, which provides automated independent and remote operation of the turbine. The SCADA data give detailed information for each turbine's operation and performance, allowing real-time control and continuous monitoring to ensure optimal operation and identification of potential problems. In the event of emergency notification or critical outage, a local wind technician is either onsite or available on-call to respond.

Table 2.1. Wind Energy Projects Operated by MidAmerican Energy Company in Iowa in 2016.

Project Name	County	Commercial Operation Date(s)	Approximate Project Area (hectares [acres])	Number of Turbines	Turbine Size (MW)	Total Project Size (MW)
Adair	Adair/Cass	2008	6,730 (16,640)	76	2.3	174.8
Adams	Adams	2015	4,098 (10,126)	64	2.3/2.4	154.3
Carroll	Carroll	2008	6,570 (16,240)	100	1.5	150
Century	Hamilton/Wright	2005, 2007	7,216 (17,831)	145	1.5/1	200
Charles City	Floyd	2008	4,721 (11,666)	50	1.5	75
Eclipse	Guthrie/Audubon	2012	8,112 (20,046)	87	2.3	200.1
Highland	O'Brien	2015	23,828 (58,880)	214	2.3	502
Ida Grove	Ida	2016	47,672 (117,800)	134	1.8/2.3	301
Intrepid	Sac/Buena Vista	2004, 2005	11,224 (27,735)	122	1.5/1	175.5
Laurel	Marshall	2011	4,144 (10,241)	52	2.3	119.6
Lundgren	Webster	2014	13,431 (33,189)	107	2.3	251
Macksburg	Madison	2014	5,814 (14,367)	51	2.3	119.6
Morning Light	Adair	2012	3,370 (8,320)	44	2.3	101.2
O’Brien	O’Brien	2016	24,465 (60,454)	104	2.3/2.4	250.3
Pomeroy	Pocahontas	2007, 2008, 2011	8,569 (21,175)	184	1.5/2.3	286.4
Rolling Hills	Cass/Adair/Adams	2011	17,925 (44,294)	193	2.3	443.9
State Fair	Polk	2007	<1 (<1)	1	0.5	0.5
Victory	Crawford/Carroll	2006	7,336 (18,129)	66	1.5	99
Vienna I	Marshall/Tama	2012	3,885 (9,600)	45	2.3	105.6
Vienna II	Marshall	2013	2,849 (7,040)	19	2.3	44.6
Walnut	Pottawattamie	2008	8,259 (20,409	102	1.5	153
Wellsburg	Grundy	2014	9,299 (22,979)	60	2.3	140.8

MW = megawatt

Table 2.2. Turbine Specifications for each of the Projects Operated by MidAmerican Energy Company in Iowa in 2016.

Project Name	Turbine Type	Tower Height (m [ft])[1]	Rotor Blade Diameter (m [ft])[1]	Max Height to Tip (m [ft])[1]
Adair	SWT-2.3-93	80 (262)	93 (305)	126.5 (415.0)
Adams	SWT-2.3-108	80 (262)	108 (354)	133.5 (438)
Carroll	GE 1.5 SLE Salem pitch	80 (262)	71 (233)	115.5 (378.9)
Century	GE 1.5 S SSB pitch; Mitsubishi 1000A; GE 1.5 SLE Salem pitch	65/69/80 (213/226/262)	70.5/61/71 (231/200/233)	100.25/99.5/115.5 (328.9/326.4/378.9)
Charles City	GE 1.5 SLE Salem pitch	80 (262)	71 (233)	115.5 (378.9)
Eclipse	SWT-2.3-108	80 (262)	108 (354)	134 (440)
Highland	SWT-2.3-108	80 (262)	108 (354)	134 (440)
Ida Grove	GE 1.79-100CW GE 2,3116 CW	80 (262)	100 (328) 116 (381)	130(427) 138(453)
Intrepid	GE 1.5 S SSB pitch; Mitsubishi 1000A	65/69 (213/226)	70.5/61 (231/200)	100.25/99.5 (328.9/326.4)
Laurel	SWT-2.3-101	80 (262)	101 (331)	130.5 (428.1)
Lundgren	SWT-2.3-108	80 (262)	108 (354)	134 (440)
Macksburg	SWT-2.3-108	80 (262)	108 (354)	134 (440)
Morning Light	SWT-2.3-108	80 (262)	108 (354)	134 (440)
O'Brien	SWT-2.346-108 SWT-2.415-108	80 (262)	108 (354)	134 (440)
Pomeroy	GE 1.5 SLE Salem pitch; SWT-2.3-101	80 (262)	71/101 (233/331)	115.5/130.5 (378.9/428.1)
Rolling Hills	SWT-2.3-101	80 (262)	101 (331)	130.5 (428.1)
State Fair	Vestas V39	40 (131)	39 (128)	59.5 (195.2)
Victory	GE 1.5 SLE SSB pitch	80 (262)	71 (233)	115.5 (378.9)
Vienna I	SWT-2.3-108	80 (262)	108 (354)	134 (440)
Vienna II	SWT-2.3-108	80 (262)	108 (354)	134 (440)
Walnut	GE 1.5 SLE Salem pitch	80 (262)	71 (233)	115.5 (378.9)
Wellsburg	SWT-2.3-108	80 (262)	108 (354)	134 (440)

[1]More than one specification for Projects with multiple phases or turbine types.
m = meter; ft = feet

Auxiliary facilities supporting wind energy generation at each Project include access roads, collection and communication lines, meteorological (met) towers and O&M facilities. A select number of wind turbines at each Project are lit with the minimum required Federal Aviation Administration (FAA) lighting (see FAA 2000) on the nacelle. Access roads at the Projects include upgraded existing roads and new roads constructed in accordance with local building requirements and industry standards to accommodate the construction, operation, and maintenance of the Projects. Turbine access roads may include crane pads at each turbine site that are designed to accommodate heavy construction and maintenance cranes. Electrical power generated by the wind turbines is transformed and collected through a network of collection circuits that are buried underground. Communications cables are also typically buried underground alongside or with the collection cables. The O&M facilities, which are shared among some Projects, consist of building space for offices, the control room and SCADA system, equipment storage, and space for other activities.

A preventative maintenance and inspection schedule has been employed at all of the Projects. Inspections of wind turbines determine the need for component repair and routine or other maintenance. Site maintenance activities include periodic mowing around O&M facilities or, in limited cases, other areas adjacent to the leased corridor that are not farmed or otherwise maintained by the landowner; periodic herbicide treatment for access roads; building inspection and repairs, as needed; occasional grading of roads to restore or repair road surface and drainage, as needed; and monthly security inspection and removal of hazards (e.g., downed trees or encroaching branches), as needed on Project components.

The operating life of each Project is typically projected to be at least 20 to 30 years. Once the useful life of the turbines at a Project is near completion, MidAmerican Energy will assess the viability of continuing to operate the existing turbines, repowering the Project by installing new or refurbished turbines, or completely decommissioning the Project. If a Project is to be decommissioned, the turbines, infrastructure, and facilities are typically removed according to Project permit requirements and landowner specifications, and are taken away, recycled, or disposed of at a licensed and appropriate waste management facility. The decommissioning process is similar in scope and duration to the construction process.

2.2 Covered Activities

The HCP Handbook (USFWS and NMFS 2016) states that an applicant should "include in the HCP a description of all actions within the planning area that: (1) are likely to result in incidental take; (2) are reasonably certain to occur over the life of the permit; and (3) for which the applicant or landowner has some form of control" ("Covered Activity").

MidAmerican Energy has determined that operation of Project turbines over the Permit term, including repowered turbines, may result in incidental take; operation of the Project turbines is therefore a Covered Activity under the HCP. In addition, actions to implement mitigation under the HCP is a Covered Activity. Because MidAmerican owns and operates electric transmission and distribution infrastructure as part of the interconnected electrical grid, measures to avoid and minimize potential take from MidAmerican's electric transmission and distribution infrastructure have been developed and are implemented separately from the Projects and are not included as Covered Activities in this HCP. No incidental take is expected to occur from auxiliary facilities or structures (or their activities) at any Project. MidAmerican Energy will implement avoidance measures where necessary for construction, repowering, maintenance, and decommissioning of the Projects (Section 5.3) to avoid take from other Project activities.

2.2.1 <u>Operation of the Projects</u>

Commercial operation of the Projects first began in December 2004 at the Intrepid facility; other Projects came online in the years 2005 to 2008, 2011, and 2012 to 2016 (Table 2.1). MidAmerican Energy anticipates that each Project will have a useful operational life of at least 20 to 30 years from the date of commercial operation. Spinning rotor blades[2] are known to cause injury to and mortality of bats and birds, including the Covered Species, through collisions of birds and bats with turbine blades (Horn et al. 2008, National Renewable Energy Laboratory [NREL] 2012). Due to the potential mortality of the Covered Species from operation of Projects, operation of all of the turbines at the 22 Projects is included as a Covered Activity in this HCP.

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[2] Bat deaths and injuries were initially thought to also result from decompression sickness, or barotrauma, which is a phenomenon in which bats flying in close proximity to rotating turbine blades are thought to experience rapid or excessive pressure change, resulting in pulmonary trauma, or lung damage due to expansion of air in the lungs that is not accommodated by exhalation (Baerwald et al. 2008). However, a recent NREL study found that the pressure changes around operating wind turbine blades were not large enough to cause fatal barotrauma in bats (NREL 2012). Simulation results showed that the pressure drop around wind turbine blades was an order of magnitude less than the amount needed to cause mortality in mice (*Mus musculus*; used as a surrogate species for bats), which in turn was significantly higher than the pressure changes experienced by bats around wind turbine blades. The authors of the study concluded that since the pressure changes around wind turbine blades at low wind speeds were insignificant, it seemed unlikely that barotrauma was a significant cause of bat fatalities around wind turbines, and that the vast majority of bat fatalities were the result of blade strikes.

2.2.1.1 Repowering Projects

MidAmerican Energy is currently repowering up to 706 General Electric (GE) turbines at seven Projects. Existing foundation, supporting tower structures, and underground collection systems will be reused. The replacement components would consist of longer blades, a replacement hub and all or parts of the gearbox and turbine nacelle assemblies. Turbine model specifications and the repower specifications for the eligible Projects are provided in Table 2.3. The continued operation of repowered Projects is a Covered Activity. The repowering process is expected to be similar to the construction process, though with a scope limited to crane stabilization pads and movement corridors, as well as equipment laydown areas. Construction of crane movement paths between existing turbine locations will reuse crane paths from original construction; no tree clearing work is need for crane path movement. Repowering activities potential impacts and avoidance measures are further described in Sections 4.1 and 5.3. It is anticipated that all repowering activities would occur from 2017 through 2020. The total number of turbines in MidAmerican's operating Projects will remain the same.

Table 2.3. GE Turbines Proposed for the Repowering Project within MidAmerican Energy's Iowa Wind Project Fleet.

Project Name	Number of Turbines	Existing		Repower	
		Cut-In Wind Speed (m/s)	Rotor Diameter (m)	Cut-In Wind Speed (m/s)	Rotor Diameter (m)
Carroll	100	3.5	77	3.0	91
Century	100	4.0	70	3.5	82.5
Century	10	3.5	77	3.0	87
Charles City	50	3.5	77	3.0	91
Intrepid	107	4.0	70	3.5	82.5
Pomeroy	171	3.5	77	3.0	91
Victory	66	3.5	77	3.0	87
Walnut	102	3.5	77	3.0	91

m/s = meters per second; m = meters

2.2.2 Mitigation Measures

The HCP includes measures to minimize and mitigate the impacts of the take resulting from Covered Activities to the maximum extent practicable. These measures are described in detail in the Conservation Program (Chapter 5). The mitigation measures are not likely to cause take, but are expected to result in beneficial impacts because they are intended to provide conservation benefits to the Covered Species. Because the authority to implement mitigation measures within occupied habitat of the Covered Species is granted in the ITP, mitigation measures are included as a Covered Activity in this HCP.

3.0 COVERED SPECIES ECOLOGY AND ENVIRONMENTAL BASELINE

The following sections describe the environmental setting of the Permit Area and the Covered Species' ecology and natural history. Information in these sections is taken largely from the scientific literature and publicly available data. Data specific to the MidAmerican-sponsored studies and research is used and referenced as appropriate throughout the HCP.

3.1 Environmental Setting

The Projects are generally located in the western two-thirds of Iowa (Figure 1.1) and fall within the Western Corn Belt Plains ecological region that encompasses most of Iowa. The Western Corn Belt Plains extend into surrounding states (Auch 2007); it is primarily a level-to-rolling glacial till plain with hilly, loess-covered plains in the west. Elevations within the Permit Area range from approximately 340 to 370 meters (m; 1,100-1,200 feet [ft]) above sea level. Cultivated crops and hay/pasture together account for more than 85% of the land cover within the Permit Area (U.S. Geological Survey [USGS] National Land Cover Database [NLCD] 2011, Homer et al. 2015; Appendix A). See Appendix A for more detailed information related to the land cover in each Project area.

3.1.1 Adair and Morning Light Wind Energy Facilities

The Adair Wind Energy Facility and the Morning Light Wind Energy Facility are two contiguous Projects located across approximately 9,980 ha (24,670 acres) in northern Cass and Adair counties in southwest Iowa. The facilities are located along and south of Interstate 80 and approximately 1.0 kilometer (km; 0.6 mile) south of the town of Adair, Iowa. The facilities are located in the Rolling Loess Prairies Level 4 Ecoregion (Chapman et al. 2001). According to the USGS NLCD, the landscape predominantly consists of cropland (approximately 72.9%) and pasture/hay (approximately 21.6%). Natural habitats consist of deciduous forest, open water, shrub steppe, woody wetlands, and emergent wetlands cover, but these are a minor portion of the land cover within the Project area (approximately 0.86%).

3.1.2 Adams Wind Energy Facility

The Adams Wind Energy Facility is located across approximately 5,341 ha (13,200 acres) in Adams County in southeastern Iowa. The Project is located approximately 2.8 km (1.7 miles) northeast of Lenox, Iowa, and is located in the Steeply Rolling Level 4 Ecoregion and Rolling Loess Prairies Level 4 Ecoregion (Chapman et al. 2001). According to the USGS NLCD, the landscape predominantly consists of cropland (approximately 68.1%), hay/pasture land (approximately 26.9%), and developed open space (approximately 2.0%). Natural habitats consist of deciduous forest, shrub steppe, open water, woody wetlands, emergent wetlands, and mixed forest, but these are a relatively small portion of the land cover within the Project area (approximately 1.7%).

3.1.3 Carroll Wind Energy Facility

The Carroll Wind Energy Facility is located across approximately 6,570 ha (16,240 acres) in Carroll County in west-central Iowa. The Project is located approximately 1.6 km (1.0 mile) northwest of Carroll, Iowa, and is located in the Des Moines Lobe Level 4 Ecoregion and Steeply Rolling Loess Prairies Level 4 Ecoregion (Chapman et al. 2001). According to the USGS NLCD, the landscape predominantly consists of cropland (approximately 87.8%). Natural habitats consist of grassland, deciduous forest, evergreen forest, emergent wetlands, and open water cover, but these are a relatively small portion of the land cover within the Project area (approximately 1.1%).

3.1.4 Century Wind Energy Facility

The Century Wind Energy Facility is located across approximately 7,216 ha (17,831 acres) in Wright and Hamilton Counties in north-central Iowa. The Project is located approximately 0.8 km (0.5 mile) north of Blairsburg, Iowa, and is located in the Des Moines Lobe Level 4 Ecoregion (Chapman et al. 2001). According to the USGS NLCD, the landscape predominantly consists of cropland (approximately 93.6%). Natural habitats consist of grassland, open water, deciduous forest, and woody wetlands cover, but these are a minor portion of the land cover within the Project area (approximately 0.7%).

3.1.5 Charles City Wind Energy Facility

The Charles City Wind Energy Facility is located across approximately 4,721 ha (11,666 acres) in Floyd County in northeast Iowa. The Project is located approximately 1.6 km southwest of Charles City, Iowa, and is located in the Eastern Iowa and Minnesota Drift Plains Level 4 Ecoregion (Chapman et al. 2001). According to the USGS NLCD, the landscape predominantly consists of cropland (approximately 88.4%). Natural habitats consist of grassland, deciduous forest, evergreen forest, wetlands, and open water cover, but together these compose only a small portion of the land cover within the Project area (approximately 4.4%).

3.1.6 Eclipse Wind Energy Facility

The Eclipse Wind Energy Facility is located across approximately 8,112 ha (20,046 acres) in Guthrie and Audubon counties in southwest Iowa. The Project is located approximately 0.8 km north of Adair, Iowa, and is located in the Rolling Loess Prairies Level 4 Ecoregion and Steeply Rolling Loess Prairies Level 4 Ecoregion (Chapman et al. 2001). According to the USGS NLCD, the landscape predominantly consists of cropland (approximately 80.5%) and pasture/hay (approximately 14.5%). Natural habitats consist of deciduous forest, open water, shrub steppe, and woody wetlands, but these are a minor portion of the land cover within the Project area (approximately 0.7%).

3.1.7 Highland Wind Energy Facility

The Highland Wind Energy Facility is located across approximately 23,626 ha (58,383 acres) in O'Brien County in northwest Iowa. The Highland Project overlaps with the O'Brien Wind Energy Facility. The Highland Project is located approximately 1.6 km north of Sutherland, Iowa, and is located in the Loess Prairies Level 4 Ecoregion (Chapman et al. 2001). According to the USGS NLCD, the landscape predominantly consists of cropland (approximately 90.9%). Natural habitats consist of grassland, evergreen forest, emergent wetlands, shrub steppe, open water, deciduous forests, and woody wetlands, but these are a relatively small portion of the land cover within the Project area (approximately 2.1%).

3.1.8 Ida Grove Wind Energy Facility

The Ida Grove Wind Energy Facility is located across approximately 26,694 ha (65,963 acres) in Ida County in east-central Iowa. The Project is located just outside of Ida Grove, Iowa, and is located in the Loess Prairies Level 4 Ecoregion and Steeply Rolling Loess Prairies Level 4 Ecoregion (Chapman et al. 2001). According to the USGS NLCD, the landscape predominantly consists of cropland (approximately 84.9%), hay/pasture land (approximately 8.0%), and developed open space (approximately 4.7%). Natural habitats consist of grassland, emergent wetlands, open water, deciduous and evergreen forest, and woody wetlands, but these are a relatively small portion of the land cover within the Project area (approximately 1.7%).

3.1.9 Intrepid Wind Energy Facility

The Intrepid Wind Energy Facility is located across approximately 11,224 ha (27,735 acres) in Sac and Buena Vista counties in northwest Iowa. The Project is located approximately 11.0 km (6.8 miles) southwest of Storm Lake, Iowa, and is located in the Loess Prairies Level 4 Ecoregion (Chapman et al. 2001). According to the USGS NLCD, the landscape predominantly consists of cropland (approximately 91.1%). Natural habitats consist of deciduous forest, grassland, emergent wetlands, and open water, but these are a minor portion of the land cover within the Project area (approximately 0.3%).

3.1.10 Laurel Wind Energy Facility

The Laurel Wind Energy Facility is located across approximately 4,144 ha (10,241 acres) in Marshall County in east-central Iowa. The Project is located approximately 1.6 km northwest of Laurel, Iowa, and is located in the Rolling Loess Prairies Level 4 Ecoregion (Chapman et al. 2001). According to the USGS NLCD, the landscape predominantly consists of cropland (approximately 82.6%) and pasture/hay (approximately 7.4%). Natural habitats consist of grassland, deciduous forest, open water, evergreen forest, woody wetlands, and emergent wetlands, which together compose a small portion of the land cover within the Project area (approximately 4.6%).

3.1.11 Lundgren Wind Energy Facility

The Lundgren Wind Energy Facility is located across approximately 13,431 ha (33,189 acres) in Webster County in north-central Iowa. The Project is located approximately 6.0 km (3.7 miles) south of Fort Dodge, Iowa, and is located in the Des Moines Lobe Level 4 Ecoregion (Chapman et al. 2001). According to the USGS NLCD, the landscape predominantly consists of cropland (approximately 92%). Natural habitats consist of grassland, deciduous forest, emergent wetlands, and woody wetlands, but these are a minor portion of the land cover within the Project area (approximately 0.9%).

3.1.12 Macksburg Wind Energy Facility

The Macksburg Wind Energy Facility is located across approximately 5,814 ha (14,367 acres) in Madison County in south-central Iowa. The Project is located approximately 0.8 km east of Macksburg, Iowa, and is located in the Rolling Loess Prairies Level 4 Ecoregion (Chapman et al. 2001). According to the USGS NLCD, the landscape is a mix of pasture/hay (approximately 44.8%) and cropland (approximately 44%). Natural habitats consist of deciduous forest, shrub steppe, grassland, woody wetlands and emergent wetlands, which together compose only a small portion of the land cover within the Project area (approximately 7.1%).

3.1.13 O’Brien Wind Energy Facility

The O’Brien Wind Energy Facility is located across approximately 24,667 ha (60,955 acres) in O’Brien County in northwest Iowa. The O’Brien Project overlaps with the Highland Project. The O’Brien Project is located adjacent to the town of Sanborn, Iowa, and is located in the Loess Prairies Level 4 Ecoregion (Chapman et al. 2001). According to the USGS NLCD, the landscape predominantly consists of cropland (approximately 90.1%) and developed open space (approximately 6.0%). Natural habitats consist of grassland, emergent wetlands, deciduous and mixed forest, open water, and shrub steppe, but these are a relatively small portion of the land cover within the Project area (approximately 2.2%).

3.1.14 Pomeroy Wind Energy Facility

The Pomeroy Wind Energy Facility is located across approximately 9,014 ha (22,276 acres) in Pocahontas County in west-central Iowa. The Project is located approximately 1.6 km east of Pomeroy, Iowa, and is located in the Des Moines Lobe Level 4 Ecoregion (Chapman et al. 2001). According to the USGS NLCD, the landscape predominantly consists of cropland (approximately 92.9%). Natural habitats consist of grassland, woody wetlands, deciduous forest, and emergent wetlands, but these are a relatively minor portion of the land cover within the Project area (approximately 0.8%).

3.1.15 Rolling Hills Wind Energy Facility

The Rolling Hills Wind Energy Facility is located across approximately 17,925 ha (44,294 acres) in Cass, Adair, and Adams counties in southwest Iowa. The Project is located just west of Bridgewater, Iowa, and is located in the Rolling Loess Prairies Level 4 Ecoregion (Chapman et al. 2001). According to the USGS NLCD, the landscape predominantly consists of cropland (approximately 53.8%) and pasture/hay (approximately 39.9%). Natural habitats consist of deciduous forest, shrub/sage steppe, open water, grassland, woody wetlands, evergreen forest, and emergent wetlands, but these are a relatively small portion of the land cover within the Project area (approximately 2.4%).

3.1.16 State Fair Turbine

The Iowa State Fair demonstration wind energy turbine is located on the Iowa State Fair Grounds in Polk County in central Iowa. The Project is located within the city of Des Moines, Iowa. The Project is located in a paved area inside of the Iowa State Fair Grounds and is operated for educational purposes and to provide some of the power used at the fairgrounds (Swoboda 2007).

3.1.17 Victory Wind Energy Facility

The Victory Wind Energy Facility is located across approximately 7,336 ha (18,129 acres) in Crawford and Carroll counties in west-central Iowa. The Project is located approximately 4.0 km (2.5 miles) west of Westside, Iowa, and is located in the Steeply Rolling Loess Prairies Level 4 Ecoregion (Chapman et al. 2001). According to the USGS NLCD, the landscape predominantly consists of cropland (approximately 90.7%). Natural habitats consist of grassland, open water, deciduous forest, and emergent wetlands, but these are a minor portion of the land cover within the Project area (approximately 0.6%).

3.1.18 Vienna I and II Wind Energy Facilities

The Vienna I Wind Energy Facility and the Vienna II Wind Energy Facility are two contiguous Projects located across approximately 6,680 ha (16,506 acres) in Marshal and Tama counties in east-central Iowa. The Projects are located approximately 0.8 km west of Beaman, Iowa, and are located in the Eastern Iowa and Minnesota Drift Plains Level 4 Ecoregion and the Rolling Loess Prairies Level 4 Ecoregion (Chapman et al. 2001). According to the USGS NLCD, the landscape predominantly consists of cropland (approximately 90.9%). Natural habitats consist of grassland deciduous forest, open water, evergreen forest, woody wetlands, and emergent wetlands, but these are a minor portion of the land cover within the Project area (approximately 0.9%).

3.1.19 Walnut Wind Energy Facility

The Walnut Wind Energy Facility is located across approximately 8,259 ha (20,409 acres) in Pottawattamie County in western Iowa. The Project is located approximately 1.6 km south of Walnut, Iowa, and is located in the Steeply Rolling Loess Prairies Level 4 Ecoregion (Chapman et al. 2001). According to the USGS NLCD, the landscape predominantly consists of cropland (approximately 85.63%), pasture/hay (approximately 5.84%), and developed open space (approximately 4.85%). Natural habitats consist of grassland, open water, woody wetlands, and emergent wetland, but these are a relatively small portion of the land cover within the Project area (approximately 1.4%).

3.1.20 Wellsburg Wind Energy Facility

The Wellsburg Wind Energy Facility is located across approximately 9,299 ha (22,979 acres) in Grundy County in east-central Iowa. The Project is located approximately 0.8 km south of Wellsburg, Iowa, and is located in the Steeply Rolling Loess Prairies Level 4 Ecoregion (Chapman et al. 2001). According to the USGS NLCD, the landscape predominantly consists of cropland (approximately 89.8%) and developed open space (approximately 6.5%). Natural habitats consist of grassland, deciduous forest, woody wetlands, and evergreen forests, but these are a relatively small portion of the land cover within the Project area (approximately 2%).

3.2 Indiana Bat

The INBA was one of the first species listed as endangered and was included on the list of endangered species in 1967 under the Endangered Species Preservation Act of 1966, prior to the enactment of the ESA of 1973. Threats were thought to be habitat loss and human disturbance, especially at winter hibernacula; not much was known about the species' biology and distribution at the time (USFWS 1999). More recently, identified threats include destruction/degradation of hibernation habitat; loss/degradation of summer, migration, and swarming habitat; disturbance of hibernating bats; disturbance of summering bats; disease and parasites; and natural factors and anthropogenic factors, as identified in *The Indiana Bat (Myotis sodalis) Draft Recovery Plan: First Revision* (2007 Draft Recovery Plan; USFWS 2007a).

Currently, the most severe range-wide threat to populations of INBA is white-nose syndrome (WNS). Over the past nine years, WNS has spread steadily westward from four caves in New York, where it was originally discovered in 2006 (see Figure 3.1, USGS 2009a, White-Nose Syndrome.org 2016).

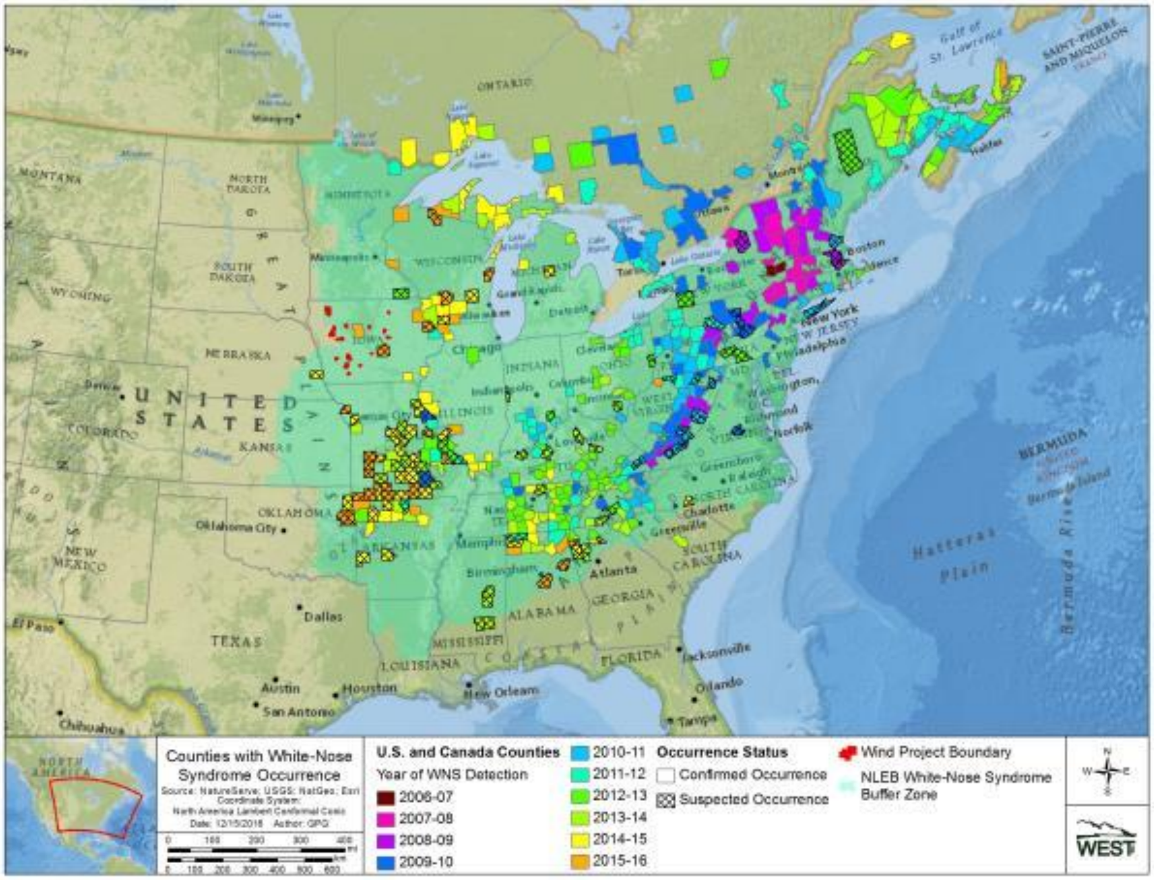

Figure 3.1. White-Nose Syndrome Occurrence over Time by County and MidAmerican Energy Company's Project Locations.

The disease is caused by a fungal pathogen (*Pseudogymnoascus destructans* [Pd]) that infects hibernating bats (Blehert et al. 2009, 2011; Minnis and Lindner 2013). As of 2015, it was estimated that more than 5.5 million bats of hibernating species had died from WNS, primarily in the northeastern U.S. (USFWS 2015d). In Iowa, the Pd fungus was first found at a hibernaculum in Iowa in the winter of 2011–2012 (Iowa Department of Natural Resources [IDNR] 2012a, White-Nose Syndrome.org 2012). Hibernating bats infected with WNS were first confirmed in Iowa during the winter of 2014-2015 in Des Moines and Van Buren counties, located in in southeastern Iowa (IDNR 2015a).

3.2.1 Life History and Characteristics

The INBA is small-sized but relatively long-lived (Barclay and Harder 2003). Like most other temperate *Myotis* species, female INBAs give birth to one young per year (Humphrey et al. 1977, Kurta and Rice 2002). Mating coincides with swarming of individuals (discussed below) in the area around the hibernacula in late summer and early fall and fertilization is delayed until the spring (Guthrie 1933).

Latitude and weather conditions dictate, in part, the timing of parturition (i.e., birth of pups) and lactation. In Iowa, female INBAs arrive at maternity roosts at the end of April and parturition is completed by mid-July (Clark et al. 1987). Once the young are born, females likely leave their pups in the diurnal roost while they forage, returning periodically during the night to feed them (Barclay and Kurta 2007). Females also regularly switch roost trees, carrying their flightless young with them. Young bats are volant (i.e., capable of flight) within three to five weeks of birth, at which time the maternity colony begins to disperse and use secondary maternity roosts (see *Spring, Summer, and Fall Habitat* in Section 3.2.2 for a description of primary and alternate roosts).

Females and juveniles may remain in the colony area until they begin migration to hibernacula. INBA maternity colonies use several roosts. In Missouri, researchers found that each maternity colony used between 10 and 20 separate roost trees (Miller et al. 2002). In Kentucky, Gumbert et al. (2002) recorded 463 roost switches over 921 radio-tracking days of tagged INBAs (predominantly males), averaging one switch every 2.21 days. Individual bats used the same roost trees consecutively from one to 12 days. Possible reasons for roost switching include thermoregulation, predator avoidance, and reduced suitability of roost trees that are an ephemeral resource that may become unusable if toppled by wind, if large pieces of bark fall away, or if the roost tree is otherwise destroyed (Kurta et al. 2002, Barclay and Kurta 2007).

In late summer and early fall, INBAs return to the vicinity of hibernacula, where the bats exhibit a behavior known as “swarming”. This involves many bats flying in and out of hibernaculum entrances from dusk to dawn, even though relatively few of the bats roost in the hibernaculum during the day (Cope and Humphrey 1977). Most INBAs roost within approximately 2.4 km (1.5 miles) of a hibernaculum during the swarming period, suggesting that the forests around hibernacula provide important habitat before hibernation (USFWS 2007a). During the swarming period, bats mate and build fat stores vital for winter survival.

Female bats enter hibernation soon after they arrive at hibernacula while males remain active for a longer period and may also travel between hibernacula; both behaviors may increase mating opportunities (USFWS 2007a). INBAs emerge from hibernacula in spring, with emergence dates ranging between mid-April and the end of May depending on latitude and weather conditions. Female bats typically emerge before male bats; both sexes travel up to hundreds of miles to summer habitats (Winhold and Kurta 2006).

3.2.2 Habitat Requirements

INBAs have two distinct habitat requirements: (1) a stable environment for winter hibernation, and (2) deciduous woodland habitat in the summer. These and other, more nuanced, habitat associations during various times in the INBA life cycle are described below.

3.2.2.1 Winter Habitat

INBAs generally hibernate between October and April, although the hibernation period may extend from September to May in northern parts of their range (USFWS 2007a). Most hibernacula are in karst areas of the east-central U.S.; however, INBAs are also known to hibernate in human-associated, cave-like structures, such as abandoned mines, buildings, a railroad tunnel in Pennsylvania, and a hydroelectric dam in Michigan (Kurta and Teramino 1994, Hicks and Novak 2002, Butchkoski and Hassinger 2002a, USFWS 2007a). INBAs typically need low, stable temperatures (3 to 8 degrees [°] Celsius [C; 37 to 46° Fahrenheit (F)]) to successfully hibernate (Brack 2004, Tuttle and Kennedy 2002).

Caves with the largest populations of INBAs are usually large, complex systems that allow for airflow yet buffer or slow changes in temperature due to cave volume and complexity (Brack 2004). These caves often include large rooms or vertical passages below the lowest entrance that allow cold air to become entrapped and stored throughout the summer, providing bats with relatively low temperatures in early fall (Tuttle and Kennedy 2002). INBAs tend to hibernate in large, dense groups that range in size from 3,300 to nearly 5,400 bats per square m (m^2; 300-500 bats per ft^2; USFWS 2007a, Boyles et al. 2008).

3.2.2.2 Spring, Summer, and Fall Habitat

During spring migration, female INBAs can travel up to 563 km (350 miles) to summer habitat, where they form maternity colonies (Winhold and Kurta 2006), although individuals radio-tracked in the northeastern U.S. appear to travel much shorter distances (less than 68 km [42 miles]; Butchkoski et al. 2008, USFWS 2007a). Habitat requirements during migration are not known. Bats may roost in multiple locations while migrating or may fly almost non-stop to summer habitat (Butchkoski and Turner 2006; Britzke et al. 2006; Hicks et al. 2005, 2012). Some male and non-reproductive female INBAs migrate shorter distances than reproductive females and stay in the vicinity of hibernacula during summer (Gardner and Cook 2002, Whitaker and Brack 2002).

Bats in a single maternity colony do not necessarily over-winter in the same hibernaculum; individuals from a single maternity colony were documented to hibernate in locations almost 322 km (200 miles) apart (Kurta and Murray 2002, Winhold and Kurta 2006). INBAs appear to be highly philopatric, using the same locations and same roosts in successive years (Barclay and Kurta 2007, Callahan et al. 1997, Humphrey et al. 1977).

In the summer, female INBAs predominantly roost under slabs of exfoliating bark and will occasionally use narrow cracks in trees; they tend not to use tree cavities, such as those created by rot or woodpeckers (Kurta 2004, Lacki et al. 2009, Timpone et al. 2010). Maternity colonies vary greatly in size with respect to number of individuals and number of roost trees used; members of a colony utilized a minimum of eight to 25 different trees in one season (Kurta 2004). Typically, roosts are found in dead trees, though partly dead or live trees (e.g. shagbark hickory [*Carya ovata*]) may also be used (USFWS 2007a).

Maternity colonies use two types of roost trees: primary roosts and alternate roosts (USFWS 2007a). Primary roosts are used throughout the summer, while alternate roosts are used less frequently and may be important during changing weather conditions (temperature and precipitation), or when the primary roost is no longer usable (Callahan et al. 1997). Primary roosts have been often found near clearings or woodland edges where the roosts received more solar radiation; this may be important for thermoregulation of reproductive females and their young (Vonhof and Barclay 1996). In severe cold temperatures, female INBAs can use torpor to conserve energy but torpor slows gestation (Racey 1973), milk production (Wilde et al. 1999), and juvenile growth, and is costly when the reproductive season is short (Hoying and Kunz 1998, Barclay and Kurta 2007). Typically, maternity colonies have been found at relatively low elevations (less than 900 m [2,953 ft] above mean sea level), which tend to have a longer growing season and more favorable average temperatures for rearing pups.

Kurta (2004) identified the species of tree for 393 roost trees in 11 states and found that 33 tree species were used, with ash (*Fraxinus* spp.), elm (*Ulmus* spp.), hickory (*Carya* spp.), maple (*Acer* spp.), poplar (*Populus* spp.), and oak (*Quercus* spp.) making up about 87% of the roost trees documented.

The smallest diameter roost tree reported to be used by male bats was 6.4 centimeters (cm; 2.5 inches) in diameter at breast height (DBH; Gumbert 2001), and 11 cm (4.3 inches) DBH (Britzke 2003) by female bats; however, these relatively small trees have not been recorded as primary roosts. The average sizes of maternity roost trees (primary and alternate) in Indiana, Missouri, and Michigan were 62, 55, and 41 cm (24, 22, and 16 inches) DBH, respectively (Whitaker and Brack 2002, Callahan et al. 1997, Kurta and Rice 2002). The differences in average diameter among states may be due, in part, to differences in the species of tree in each sample: in Indiana, the sample was dominated by cottonwood (*Populus* spp.), while in Missouri the sample was dominated by oak and hickory, and in Michigan, by ash. Other important factors affecting tree diameter include site quality and tree age.

Most maternity colonies have been found in agricultural areas with fragmented forests. An important landscape characteristic for maternity roost sites is the presence of a mosaic of woodland and open areas (USFWS 2007a). The average proportion of canopy cover is highly variable among studies, ranging from less than 20% to nearly 90% (USFWS 2007a). Based on modeling efforts, Pauli et al. (2015) determined that the occupancy of roosts by INBAs on public lands in Indiana (based on 206 previously identified roosts) was greatest in localized areas with more than 80% forest cover that are contained within a broader landscape (i.e., within one km) that had less than 40% forest cover. Lending support to this finding, other studies have documented roost trees in closed-canopy forests (e.g., Gardner et al. [1991] reported that 32 of 48 roost trees documented in Illinois occurred within forests with 80% to 100% canopy closure). In the modeling study, roost occupancy was also greatest in habitats that were less than one km from perennial streams and greater than one km from intermittent streams. Although these findings differ from studies that have reported primary roosts are usually found in areas with high solar exposure, INBAs may obtain proper solar exposure in closed canopies by selecting roosts occurring in natural or man-made gaps in forests and roosting in trees that reach above the surrounding canopy (Kurta 2004).

Female bats likely switch roosts based upon factors such as reproductive condition, roost type, roost condition, time of year, and predation (Kurta et al. 2002, USFWS 2007a). On average, female bats switch roosts every two to three days, occasionally returning to previous roost trees.

The primary roost of a maternity colony may change between maternity seasons, but the foraging areas and commuting paths are thought to be relatively constant (Barclay and Kurta 2007). For example, members of a maternity colony in Michigan traveled regularly along a wooded fence-line for nine years (Winhold et al. 2005). Individuals from a maternity colony appear to use the same general home range within and between years (Sparks et al. 2004, Lacki et al. 2007). Distances travelled from roost trees to foraging areas varied from 0.5 to 8.4 km (0.3 to 5.3 miles; USFWS 2007a) and were likely limited by the need to return to the roost occasionally after young were born (Henry et al. 2002).

In Indiana, mean home range was 145 ± 18 ha (357 ± 45 acres; Sparks et al. 2005), while on the Vermont-New York state line, mean home range was 83 ± 82 ha (205 ± 203 acres; Watrous et al. 2006). In Pennsylvania, a single female used a home range estimated at 21 ha (51 acres; Butchkoski and Turner 2006). Habitat quality and differences in methodology are likely factors for variation in the size of home ranges.

During the swarming period, both sexes roost in wooded habitat around hibernacula. Data on roosts used by swarming INBAs are limited; swarming INBAs in Kentucky roosted in trees of species similar to those used during the summer reproductive period, but the trees tended to be smaller in size than for summer roosts (Kiser and Elliot 1996, Gumbert 2001).

3.2.3 Demographics

Little is known about annual survival rates, recruitment, and background mortality for either adult or juvenile INBAs. It is likely that, as with other bat species, survival of INBAs is lowest during the first year of life, after which threats and sources of mortality vary during the annual cycle (USFWS 2007a). Sources of summer mortality may by caused by loss of occupied forested habitat, predation, human disturbance, and other man-made disturbances (Kurta et al. 2002, USFWS 2007a). In the winter, causes of mortality may include natural predation, natural disasters that impact hibernacula, disturbance or modifications at hibernacula and surrounding areas that physically disturb the bats or change the microclimate within hibernacula, and direct human disturbance during hibernation that leads to disruption of normal hibernation patterns (USFWS 2007a). WNS is currently one of the most important sources of mortality of cave-hibernating bats such as INBAs (USFWS 2012b).

In a study in Indiana, survival rates for male and female INBAs ranged from 66% to 76% for six to 10 years after marking; female bats lived approximately 12 to 15 years and male bats lived approximately 14 years (Humphrey and Cope 1977). The oldest known INBA was captured 20 years after the first capture (LaVal and LaVal 1980). Research from banding studies during the 1970s suggests that the annual survival of adult INBAs during the first six years varies from approximately 70-76% annually (i.e., an average of 70-76% of the bats studied survived each year), decreases to 36-66% between ages seven to nine, and drops to approximately 4% after age 10 (Humphrey and Cope 1977, O'Shea et al. 2004, USFWS 2007a). Little is known about neonatal survival, but one published study presented a survival rate of 92% based on observations at a single maternal colony over one single season (Humphrey et al. 1977). Available information suggests that annual mortality likely ranges from 8% to 64% during the first 10 years of an INBA's lifespan (USFWS 2007a).

In a review of past sampling efforts, O'Shea et al. (2004) summarized survival rates for the LBBA, a species with a life history similar to that of the INBA. LBBA survival rates ranged from approximately 13-86% and were considerably more variable. This variability in annual survival rates was shared by other *Myotis* species, ranging from about 6-89%, and studies indicated that survival for first-year juveniles was generally lower than for adults (O'Shea et al. 2004).

Female INBAs typically give birth to one young per year (Mumford and Calvert 1960, Humphrey et al. 1977, Thomson 1982). The proportion of females in a population that produce young in a year is thought to be fairly high (USFWS 2007a), reported as 89-90% in two studies (Humphrey et al. 1977, Kurta and Rice 2002). Reproductive rates are likely influenced by location and environmental factors, while environmental threats, including WNS, may lead to lower reproduction rates (76 Fed. Reg. 38,095 (2011); USFWS 2011a). In 2015, from the most recent data available, the total population of INBAs was estimated to be 523,636 individuals, which is about 17.6% lower than the estimated 2007 population of 635,349 INBAs and 9.8% lower than the estimated 2013 population of 580,717 INBAs (USFWS 2015e).

Recruitment in the total INBA population has varied across Recovery Units in recent years. MidAmerican's Projects within INBA range in Iowa are located in the Ozark-Central Recovery Unit (OCRU) that supported approximately half of the total hibernating INBA population in 2015 (USFWS 2015e). The INBA population within the OCRU has been relatively stable since 2007 (243,142 INBAs in 2015; USFWS 2015e). INBA population sizes in the Northeast Recovery Unit and the Appalachian Mountain Recovery Unit have decreased substantially, likely due to WNS; since 2013, the Appalachian Mountain Recovery Unit population alone dropped 70%, from 17,584 to 5,258 INBAs, while populations are down 13.9% to 15,728 INBAs in the Northeast Recovery Unit (USFWS 2015e). In the Midwest Recovery Unit, the INBA population decreased 13.8% from 2013 to 2015, to 259,508 INBAs (USFWS 2015e).

3.2.4 Range and Distribution

The range of the INBA includes all or parts of 22 states in the eastern U.S. (Gardner and Cook 2002, USFWS 2007a; Figure 3.2). Historically, the winter range of the INBA was limited to areas of cavernous limestone in the karst regions of the east-central U.S., including Iowa. Currently, the INBA range in Iowa is approximately the south-eastern third of the state (Figure 3.3).

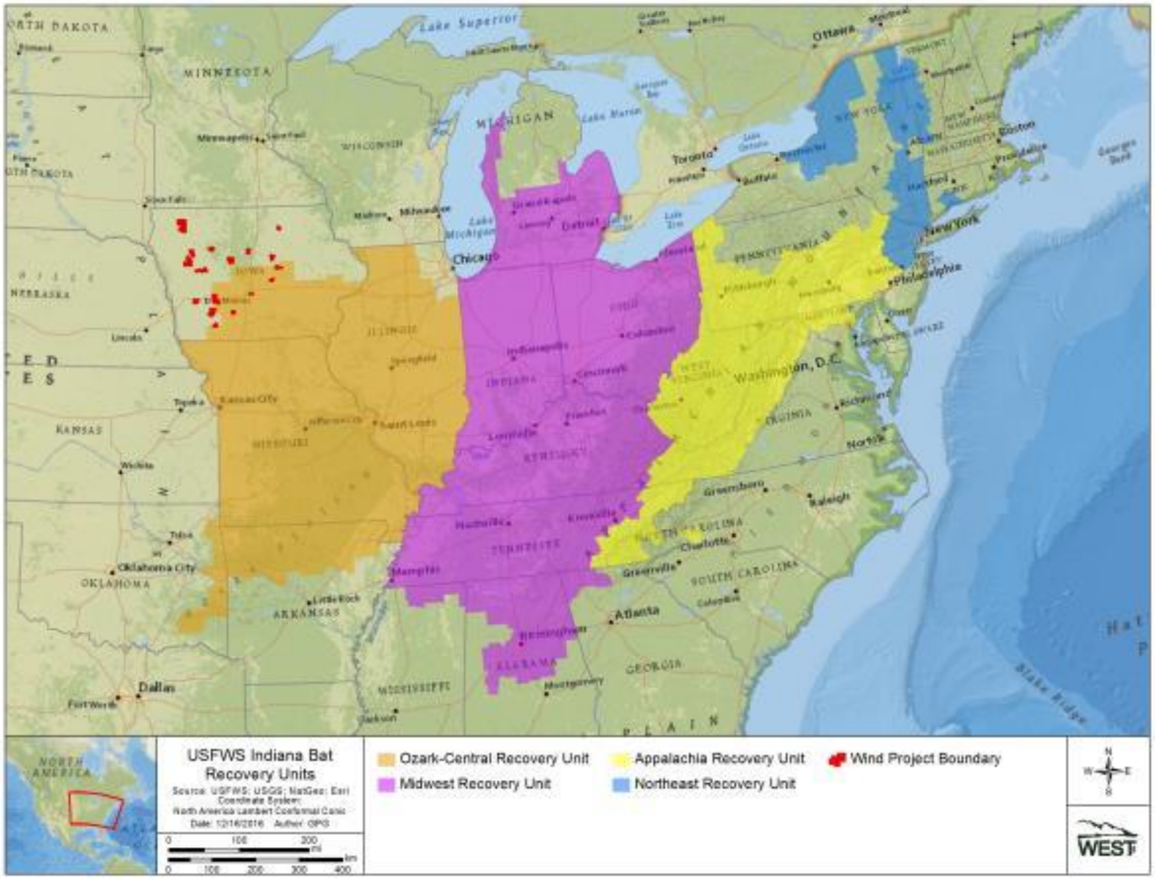

Figure 3.2. Approximate Range of the Indiana Bat in the United States, as Divided into Recovery Units by the U.S. Fish and Wildlife Service, and MidAmerican Energy Company's Project Locations.

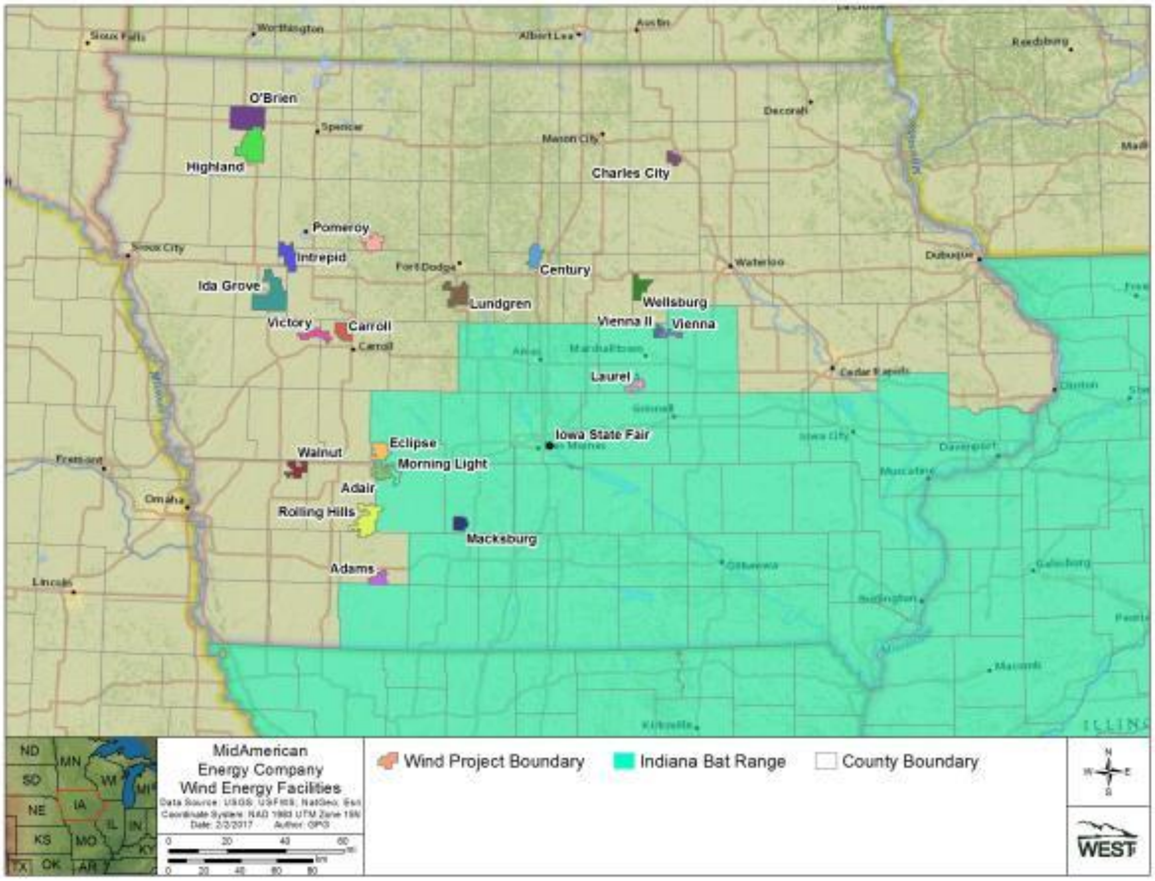

Figure 3.3. Approximate Range of the Indiana Bat in Iowa and MidAmerican Energy Company's Project Locations.

The hibernating population was historically concentrated in a relatively small number of large, complex cave systems, including Wyandotte Cave in Indiana; Bat, Coach, and Mammoth caves in Kentucky; Great Scott Cave in Missouri; and Rocky Hollow Cave in Virginia. More recently, increasing numbers of INBAs have been observed using man-made structures for hibernacula, such as buildings, mines, and tunnels; this has expanded the species' winter range into some cave-less parts of the country (Kurta and Teramino 1994). For example, approximately 167,000 INBAs were recently discovered in an abandoned mine in Missouri, a value that has been added to all population estimates for Missouri since 1981 (USFWS 2015e). INBAs also have been found hibernating in several man-made tunnels (Butchkoski and Hassinger 2002b). In 1993, an INBA was discovered hibernating in a hydroelectric dam in Manistee County, Michigan, which is 450 km (281 miles) from the closest recorded hibernaculum for INBAs in LaSalle County, Illinois (Kurta and Teramino 1994). In 2015, about 45% of the population hibernated in man-made structures (predominantly mines), while the remainder used natural caves (USFWS 2015e). As of November 2006, 281 extant INBA hibernacula in 19 states were known (USFWS 2007a). As of 2015, over 90% of the population hibernated in five states: Indiana (35.5%), Missouri (35.5%), Kentucky (12.6%), Illinois (10.7%), and New York (3.0%; USFWS 2015e); with most (86.4% of the total population) hibernating in 17 hibernacula (USFWS 2015e).

Characteristics of the historic summer range of INBAs are not well known. It is thought that the historic summer distribution for this species was similar to the current distribution, but the first maternity colony was not recorded until 1971 (Cope et al. 1974). As of October 2006, the USFWS had records of 269 maternity colonies in 16 states, which likely represent only about 6% to 9% of the 2,859 to 4,574 colonies thought to exist based on the estimated total wintering population (Whitaker and Brack 2002, USFWS 2007a).

The extent of INBA summer habitat in the eastern U.S. seems smaller than in the Midwest (Figure 3.2), perhaps because the geographic distribution of important hibernacula or differences in climate and elevation may limit the suitability of sites for maternity colonies in the east. Summer temperatures of the eastern portions of INBA range are slightly cooler than in the core part of the range in Indiana and Kentucky; this may influence the energetic feasibility of reproduction in eastern areas (Brack et al. 2002, Woodward and Hoffman 1991).

3.2.5 Dispersal and Migration

Species can be divided into three movement categories that describe their migration habits (Fleming and Eby 2005): (1) sedentary species that breed and hibernate in the same local areas and usually move less than 48 km (30 miles) between summer and winter roosts; (2) regional migrants that migrate moderate distances between approximately 100 to 500 km (60 to 310 miles); and (3) long-distance migrants that have developed migratory behavior, sometimes traveling greater than 1,000 km (620 miles) between summer and winter roosts. The distances that INBAs disperse from winter hibernacula to summer roost sites varies across their range and INBAs can be categorized as both a sedentary and regional migrant species, depending on location. For example, 12 female INBAs in Michigan moved an average of 477 km (296 miles) to hibernacula in Indiana and Kentucky, with one individual migrating as far as 575 km (357 miles; Winhold and Kurta 2006). At the other extreme, dispersal movements of more than 100 tagged INBAs in New York were typically less than 60 km (35 miles), and in many cases only a few miles from the hibernaculum (A. Hicks, New York State Department of Environmental Conservation [NYSDEC], personal communication [pers. comm.]). Based on the results of studies to date in the published literature, the summer range of INBAs could be any suitable habitat within approximately 575 km of a known winter hibernaculum.

The 2007 Draft Recovery Plan defines the main spring migration season as the end of March to late May, and the main fall migration period as the end of July to mid-October. Actual migration periods vary by latitude and weather, with spring emergence occurring earlier in more southern areas and fall migration occurring earlier in more northern areas (USFWS 2007a). Relatively little is known about migration activities, such as flight heights, echolocation frequency and use, the influence of weather, or whether INBAs migrate singly or in groups.

Although data regarding the height at which INBAs fly during migration are lacking, six of the nine INBA fatalities that have been documented to date at wind facilities occurred during the fall and one occurred during the spring migration periods. Documented mortality of many other myotids at wind facilities has also occurred primarily during late summer and fall migration period (see USFWS 2010, 2011b, 2011c, 2012c, 2012d; Pruitt and Okajima 2018). However, data suggest that cave-dwelling bat species may not fly within the rotor-swept zone as frequently as long-distance migrating tree bats: in fatality monitoring data collected at wind power facilities within the range of the INBA, myotids and TRBAs made up fewer than 10% of the total bat fatalities (USFWS unpublished data, as cited in USFWS 2011d).

Anecdotal evidence and empirical data support the assumption that INBAs mostly migrate at the tree canopy level (Turner 2006; L. Robbins, Missouri State University, pers. comm. 2010; C. Butchkoski, Pennsylvania Game Commission [PGC], pers. comm. 2010; C. Herzog NYSDEC, pers. comm. 2011; as cited in USFWS 2011d). Chenger and Turner (J. Chenger, Bat Conservation Management, and G. Turner, PGC, pers. comm. 2011, as cited in USFWS 2011d) indicate that INBAs in the northeast closely follow topographic features, such as meandering stream corridors and utility rights of way, for miles during spring migration, exhibiting this pattern of landscape use over multiple years. Similar findings have been reported in Tennessee and Illinois, indicating that INBAs fly near the canopy level during migration (Gumbert et al. 2011, Hicks et al. 2012). However, it is uncertain if flight heights suggested in these studies should be extrapolated to other parts of the species' range. It is also unknown whether flight heights for spring and fall migration are similar. Of the nine INBA fatalities documented in publicly available post-construction monitoring reports at wind energy facilities, six have occurred in fall (one in spring, two in summer); if risk of INBA mortality is higher during the fall migration season, it is unknown if this is the result of differences in migration flight height or other differences in migration behavior.

Results from a few telemetry studies during spring and fall migration indicate that INBA individuals may migrate at the same time but perhaps independently (S. Darling, Vermont Department of Fish and Wildlife, pers. comm. 2010, J. Chenger, pers. comm. 2011, R. Reynolds, Virginia Department of Game and Inland Fisheries, pers. comm. 2010, as cited in USFWS 2011d; Hicks et al. 2012). Female INBAs may migrate in pulses in a given area because they are likely cued into the same climatic or environmental stimuli during the spring and fall migration and it is reasonable to assume that at least some individuals leave summer colonies together or at least contemporaneously (L. Pruitt, USFWS, pers. comm. 2011; R. Reynolds, pers. comm. 2010; as cited in USFWS 2011d). However, at least some female bats likely migrate independently because female bats from the same maternity colony do not all hibernate in the same hibernaculum (though some do; Kurta and Murray 2002, Winhold and Kurta 2006).

INBAs are capable of migrating at least 48 to 64 km (30 to 40 miles) in one night as recorded in radio-tracking studies in New York and Pennsylvania (Sanders et al. 2001, Hicks 2004, Butchkoski and Turner 2006). Studies indicate that although spring INBA migration from winter to summer habitat is fairly direct and short-term, fall migration may be more dispersed and varied (USFWS 2007a, Hicks et al. 2012). Also, male and female bats appear to use different dispersal behaviors, with female bats moving relatively quickly between hibernacula and maternity colonies and male bats commonly remaining near hibernacula or traveling between hibernacula (USFWS 2007a).

Bat activity, including migration, and temperatures are positively correlated both over an annual time period (O'Farrell and Bradley 1970, Avery 1985, Rydell 1991, as cited in USFWS 2011d) and on a nightly basis (Lacki 1984, Hayes 1997, Vaughan et al. 1997, Gaisler et al. 1998, Shiel and Fairley 1998, as cited in USFWS 2011d). Bat experts consulted by the USFWS (2011d) noted that weather conditions such as heavy rain, high wind, heavy fog, and cold (some specifically cited temperatures below 10 to 13 °C [50 to 55 °F]) impair flight, impair the ability to thermoregulate, or reduce insect activity, resulting in reduced bat activity. These observations are corroborated by data obtained from fatality monitoring at wind energy facilities where correlations between weather conditions (i.e., temperature, wind speeds, and storm fronts) and bat activity have been recorded. Although general patterns have been established, the specific environmental thresholds are not yet clearly understood.

3.2.6 Species Status and Occurrence

3.2.6.1 Range-Wide

The maintenance of suitable hibernacula is essential to the survival and recovery of the INBA and will help to ensure the over-winter survival of sufficient individuals to maintain population viability. The 2007 Draft Recovery Plan classifies hibernacula into four groups based on how important they are (priority) to the species population and distribution. Priority 1 hibernacula are essential to the recovery and long-term conservation of the species and have a current or historically observed winter population of 10,000 or more individuals. Priority 2 hibernacula contribute to the recovery and long-term conservation of the species and have a current or historical population of more than 1,000 but less than 10,000 individuals. Priority 3 sites have a current or historical population of 50 to 1,000 bats and Priority 4 sites have a current or historical population of fewer than 50 bats (USFWS 2007a).

Since the release of the first INBA Recovery Plan (USFWS 1983), the USFWS implemented a biennial monitoring program at Priority 1 and Priority 2 hibernacula (USFWS 2007a). In 1965, the overall population was estimated to be over 880,000 individuals. However, while variation in the data collection apparently has led to variable estimates, in general, there has been a long-term declining population trend, with approximately 496,027 individuals reported in 2001 (USFWS 2015e). The population showed a gradual increase to 635,349 INBAs by 2007, but fell to 523,636 bats in 2015 (USFWS 2015e). A high proportion of that decline (more than 50%) is probably due to the effects of WNS, such as those documented in Turner et al. (2011).

As of 2007, general patterns in the overall population estimates showed a decreasing trend through the core range of the species in the Midwest and an increasing trend on the periphery and more northern states (USFWS 2007a). While the causes of these population changes are unknown, climate change may play a role by negatively affecting hibernacula temperature (USFWS 2007a). More recently, WNS has negatively affected populations in the northeastern and eastern U.S., which is having a dramatic effect on populations in several states including New York, Pennsylvania, Vermont, Virginia, and West Virginia (Turner et al. 2011). In 2010, INBA mortality rates averaged 72% in WNS-infected hibernacula in the Northeast (Turner et al. 2011).

3.2.6.2 Ozark-Central Recovery Unit

The 2007 Draft Recovery Plan divides the species' range into four recovery units based on factors including banding returns, genetic variation, and traditional taxonomic studies (USFWS 2007a). The subset of Projects located within the INBA range (identified in Section 3.2.6.2 below) is within the OCRU. The OCRU includes all or parts of the states of Iowa, Illinois, Missouri, Arkansas, and Oklahoma (USFWS 2007a). According to the *2015 Rangewide Population Estimate for the Indiana Bat (Myotis sodalis) by USFWS Region* (USFWS 2015e), the overall population within the OCRU was 245,310 INBAs in 2011, 243,946 INBAs in 2013 (a decrease of 0.1%), and 243,142 INBAs in 2015 (a decrease of 0.3%; Table 3.1). The OCRU represents 46.4% of the 2015 range-wide population of INBAs (USFWS 2015e). According to the 2007 Draft Recovery Plan, there are 126 known INBA hibernacula[3] within the OCRU, with 72 being classified as extant (i.e., having at least one recorded INBA during census counts since 2000; USFWS 2007d). There are seven Priority 1 hibernacula in the OCRU; one in Illinois and six in Missouri. Two Priority 4 hibernacula are listed for Iowa but neither is classified as extant (USFWS 2007d; Figure 3.4). Some records of summer roosting by INBAs are known for Iowa, and the species is thought to occur fairly regularly in the southeast quadrant of Iowa, from Guthrie County west to the Mississippi River, and Boone County south to the Missouri State line (McPeek 2015; Figure 3.5). Some records of mist-netting efforts conducted in Iowa are known and show that the INBA has been present in Iowa within the last 50 years; from 1965 – 1991, a total of 69 INBAs were captured in these studies (Bowles et al. 2009).

Table 3.1. Indiana Bat Population Estimates for the Ozark-Central Recovery Unit (USFWS 2015e).

State[1]	2007	2009	2011	2013	2015
Illinois	53,824	53,342	61,239	58,840	56,055
Missouri	183,304	181,097	182,852	184,245	185,693
Arkansas	1,821	1,480	1,206	856	1,389
Oklahoma	0	0	13	5	5
Total	**238,949**	**235,919**	**245,310**	**243,946**	**243,142**

[1] Population estimates for Iowa are not included in USFWS 2015e. No population estimates for Iowa are included in the report.

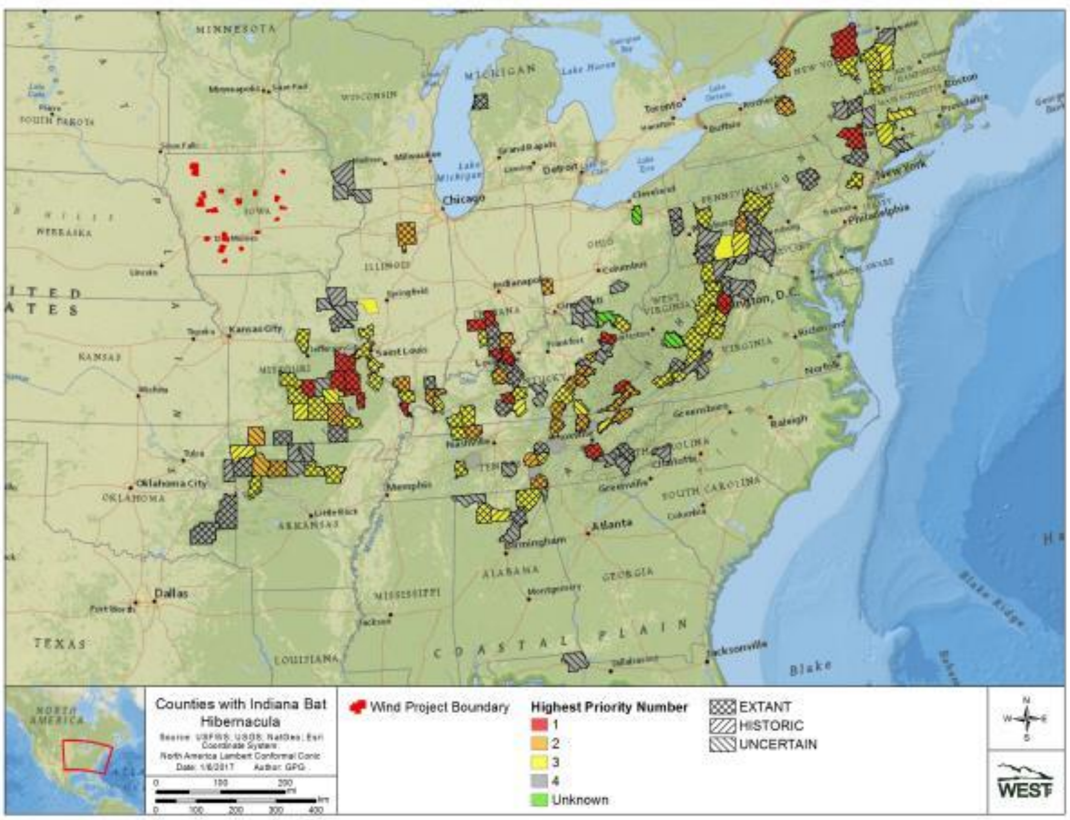

Figure 3.4. Counties with Historic or Extant Indiana Bat Hibernacula and MidAmerican Energy Company's Project Locations.

[3] This value excludes the previously unknown Indiana bat hibernaculum discovered in Missouri in 2012 (USFWS 2015a).

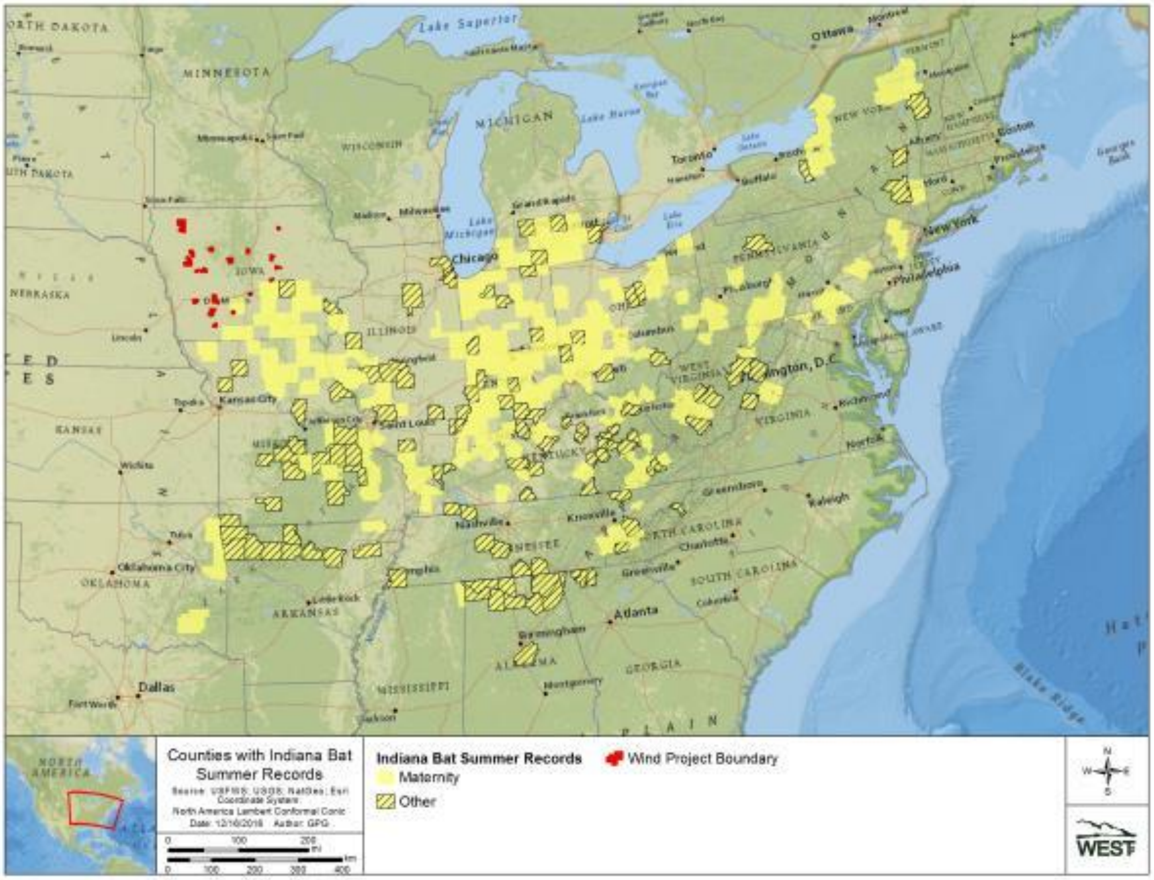

Figure 3.5. Counties with Indiana Bat Summer Maternity Colony Records and MidAmerican Energy Company's Project Locations.

3.2.6.3 Project Site/Local Population

Eight Projects[4] occur within the range of the INBA in Iowa and the OCRU (Figure 3.2 and Figure 3.3), including Adair, Eclipse, Laurel, Macksburg, Morning Light, Rolling Hills, and Vienna I and II. These Projects are located on the northernmost and westernmost part of the species range. The Adair, Laurel, and Macksburg Projects are located in counties in which summer maternity colonies of INBAs have been recorded (Figure 3.5; A. Schorg, USFWS, pers. comm. 2017); all three are situated in the interior of the OCRU area. The remaining six Projects are located on the northwest boundary of the OCRU, often with only part of a Project contained within the OCRU.

All known INBA hibernacula are located either east or south of the Projects by a minimum of several dozen miles (Figure 3.4). With the recent discovery of a Priority 1 hibernacula in northeast Missouri, some of the INBAs in Iowa may migrate in a southeasterly direction to this hibernaculum. Only one INBA call confirmed with qualitative review was detected by summer 2015 acoustic surveys conducted at the Laurel Project in Marshall County, indicating presence of INBAs at this Project; no INBA calls were detected at the other seven Projects within the Iowa INBA range during the summer 2015 acoustic surveys, indicating likely absence of INBAs at these

[4] The single turbine located at the Iowa State Fair ground owned by MidAmerican Energy is also located within the INBA range in Iowa.

Projects (Western Ecosystems Technology, Inc. [WEST] 2016; see Section 3.3.6.3 below for a detailed description of the surveys). No INBAs were captured during mist-netting conducted at Macksburg and IDNR lands in Iowa for the migration study in August 2015 (WEST 2016).

Post-construction fatality monitoring was conducted at nine of the Projects between December 1, 2014, and November 13, 2015: Adair, Carroll, Eclipse, Lundgren, Macksburg, Morning Light, Rolling Hills, Victory, and Walnut. Although 907 bat fatalities of seven bat species were found during scheduled turbine searches and incidentally outside of the search plots, no INBA fatalities were found (Bay et al. 2016a). Post-construction fatality monitoring was conducted between November 16, 2015, and November 16, 2016, at 13 of the Projects, including Adams, Century, Charles City, Highland, Intrepid, Laurel, Lundgren, Macksburg, Pomeroy, Rolling Hills, Vienna I and II, and Wellsburg. A total of 2,305 fatalities from eight bat species were found during scheduled turbine searches and incidentally outside of the search plots. One INBA was found at Macksburg (Bay et al. 2017).

3.3 Northern Long-Eared Bat

For most of the 20th century, the NLEB was considered a subspecies of Keen's bat (*Myotis keenii*); now they are considered to be two genetically distinct species (Caceres and Pybus 1997, Center for Biological Diversity [CBD] 2010). Before the 1980s, most literature about Keen's bat actually pertained to the NLEB.

The NLEB has historically been a common bat species in the Midwest and northeastern U.S., with a relatively large continental range extending into most of Canada and other forested regions of the U.S. Recently, the global status of the NLEB was changed to G1, indicating it is now considered a critically-imperiled species (NatureServe 2015).

In August 2010, the USFWS received a petition to list NLEB as threatened or endangered (CBD 2010). In October 2013, the USFWS released a 12-month finding on the petition determining that listing the NLEB is warranted and proposed to list the species as an endangered species under the ESA (78 Fed. Reg. 61,046 (2013); USFWS 2013b). The April 2015 final listing decision designated the NLEB as a threatened species (USFWS 2015c), primarily due to the threat from WNS. An estimated 5.7 to 6.7 million bats, including NLEBs, had died from WNS by 2012, primarily in the northeastern U.S. (USFWS 2012b).

The Pd fungus was first detected at a hibernaculum in Iowa in the winter of 2011–2012 (IDNR 2012a, White-Nose Syndrome.org 2012). The first confirmed hibernating bats infected with WNS were detected during the winter of 2014-2015 in Des Moines and Van Buren counties in southeastern Iowa (IDNR 2015a).

3.3.1 Life History and Characteristics

NLEBs exhibit life history traits similar to other temperate myotids, including the INBA described above in Section 3.2. In spring, females leave hibernacula and form maternity colonies of 30-60 individuals on average (USFWS 2014, 2016d). Regional conditions likely dictate parturition dates and subsequent weaning schedules (Foster and Kurta 1999). In New Brunswick, Canada, Broders et al. (2006) determined that, over a 3-year period, parturition occurred in mid- to late-July. Other studies suggest that parturition dates for populations in the southeastern U.S. occur between mid-May and mid-June (Caire et al. 1979, Cope and Humphrey 1972).

Generally, female NLEBs roost communally while male bats choose solitary roosts (Caceres and Barclay 2000). While NLEBs have shown site fidelity related to summer roost habitat, Foster and Kurta (1999) found that NLEBs switched roost trees about every two days. Individuals move to hibernacula between late July and late October. Copulation occurs near hibernacula during fall swarming behavior; however, actual fertilization does not occur until spring (Caceres and Barclay 2000).

NLEBs are thought to be opportunistic insectivores that mostly glean prey from substrates (Faure et al. 1993). These bats forage under the forest canopy at small ponds or streams, near paths and roads, or at the forest edge (Caire et al. 1979).

3.3.2 Habitat Requirements

3.3.2.1 Winter Habitat

Caves and mines have been most frequently reported as hibernacula for NLEBs (Whitaker and Winter 1977, Stones 1981, Griffin 1940). The species hibernates in caves or abandoned mines with INBAs, LBBAs, big brown bats (*Eptesicus fuscus*), and TRBAs (Caire et al. 1979, Mills 1971, Boyles et al. 2009). Generally, NLEBs make up a small proportion of the total known hibernating population within a hibernaculum (less than or equal to 1% to 15%; NatureServe 2009, as cited by CBD 2010). NLEBs hibernate as individuals and small groups, favoring deep crevices, unlike the large aggregations or clusters usually formed by other *Myotis* species (Caceres and Barclay 2000). Therefore, very few hibernating individuals may be found even in caves already known to be hibernacula used by the species (Whitaker et al. 2002). It is rare to find more than 100 individuals documented per hibernation colony (Barbour and Davis 1969, Caire et al. 1979); however mist-netting surveys conducted at cave and mine entrances suggest that NLEBs using the hibernaculum are much more numerous compared to the numbers documented by counts of hibernating individuals (Whitaker et al. 2002). Although they have been reported to occasionally move between hibernacula during the winter, NLEBs generally exhibit strong philopatry to hibernacula (Whitaker and Rissler 1992). As part of the Section 6 HCP grant activities, trained canine surveys were conducted in February 2017 at fractured bedrock outcrops in Boone, Hardin, Madison, Mahaska, and Webster counties. The surveys were conducted near rock formations that had been surveyed in 2016 with acoustic detectors that had identified potential bat activity during early spring emergence period or late fall. The canine surveys indicated potential bat winter habitat use, including the observance of bats emerging from a large vertical fissure on the face of an outcrop during the canine survey in Hardin County, Iowa. The handlers closely observed the canine searchers for either a discrete “Alert” or a change of behavior. An alert is the canine searcher’s conditioned response upon determining she is as close as possible to the target scent. A change of behavior is based on the handler’s observations that the canine searcher is demonstrating behavior consistent with being in the presence of the target scent, but has not performed an alert. The report indicates that an alert or change of behavior from the canine searchers are equally indicative of the canine searchers detection of the target scent. In all, canine surveys were conducted at eight potential hibernacula locations, covering approximately 29 km (18 miles) of linear search distance along targeted bedrock outcrop structures. This search effort recorded eight alerts and 11 change of behavior events at 19 discrete locations within the searched areas (Hurt 2017). The IDNR is planning to conduct further monitoring as part of the 2017 Section 6 grant supported activities, including monitoring potential winter habitat locations to determine species using these areas.

3.3.2.2 Spring, Summer, and Fall Habitat

Little information is available about spring emergence and dispersal of NLEBs from hibernacula, but the length of hibernation varies with region and climate (Caceres and Barclay 2000). Spring emergence occurs between March and May (Caire et al. 1979, Fenton 1969, Nagorsen and Brigham 1993, Whitaker and Rissler 1992), depending on region. As with other *Myotis* species, NLEBs mate in the fall and ovulation and fertilization occur shortly after females awaken in the spring (Caceres and Barclay 2000).

Following spring emergence, NLEBs migrate to their summer habitat. The direction of spring migration appears to radiate outward from hibernacula, with females migrating directly to their natal sites rather than moving primarily north or south (Davis and Hitchcock 1965, Fenton 1970, Griffin 1970, Humphrey and Cope 1976). This pattern may be similar to that of LBBAs. Although little is known about the migration habits of male NLEBs, they have been captured midsummer outside known hibernacula, suggesting that some male bats migrate relatively short distances from their hibernacula (Davis and Hitchcock 1965). Male bats of other *Myotis* species form small bachelor colonies or stay close to known hibernacula, a strategy that could also be employed by the closely related male NLEBs (Davis and Hitchcock 1965).

NLEBs select live trees and/or snags for roosts and can be found in cracks, crevices, and under peeling bark (USFWS 2014). Suitable NLEB roosts are trees (live, dying, dead, or snag) with a DBH of eight cm (three inches) or greater that exhibit any of the following characteristics: exfoliating bark, crevices, cavities, or cracks (USFWS 2014). Roost selection varies by gender: female bats form maternity colonies in snags while solitary male bats roost in live tree cavities (Lacki and Schwierjohann 2001, Broders and Forbes 2004, Caceres and Barclay 2000). The fall 2015 NLEB migration study conducted in Iowa tracked female NLEBs to five roost trees (WEST 2016). Four of the five roosts were in oak trees; two in bur oaks (*Quercus macrocarpa),* one in white oak (*Q. alba*), one in unidentified oak species, and one in a basswood (*Tilia americana*) tree. Three of the five roost trees found were snags, while the remaining two were living with dead branches and crevices. Average tree height of all found roosts was 13.0 m (42.7 ft), and the average DBH was 54.8 cm (21.6 inches). Seven emergence counts were conducted at four of the roosts, resulting in counts ranging from zero to seven bats emerging from a roost tree in a night (WEST 2016).

Maternity colonies occur more often in shade-tolerant stands of deciduous trees and in tree species that are susceptible to cavity formation (Broders and Forbes 2004). NLEBs are also more likely to form colony roosts in stands with higher density of snags (Lacki and Schwierjohann 2001). Roost occupancy based on 93 known roost locations on public lands in Indiana was greatest in areas with more than 80% forest cover regionally, with moderate amounts of forest edges occurring locally (Pauli et al. 2015). Female bats may roost alone, but often roost colonially in numbers ranging from 30 (Whitaker and Mumford 2009 as cited in 78 Fed. Reg. 61,046 (2013)) to 60 (Caceres and

Barclay 2000 as cited in 78 Fed. Reg. 61,046 (2013)) and up to 100 individuals (Layne 1978, Dickinson et al. 2009, Whitaker and Mumford 2009 as cited in 78 Fed. Reg. 61,046 (2013)).

NLEBs are foragers in intact forests and do not feed in intensively harvested stands or open agricultural areas (Patriquin and Barclay 2003, Henderson and Broders 2008). They forage under the forest canopy at small ponds or streams, along paths and roads, or at the forest edge (Caire et al. 1979). NLEBs have low wing loading and a low aspect ratio, characteristics that make them highly maneuverable in forested habitat and therefore well-adapted to foraging in dense vegetation (Patriquin and Barclay 2003, Carter and Feldhamer 2005). NLEBs have frequently been observed foraging near ephemeral upland pools (Brooks and Ford 2005, Owen et al. 2003). The home range of the NLEB in managed forests of West Virginia averaged 65 ha (161 acres); areas smaller than this were considered unsuitable habitat (Owen et al. 2003). Female bats have been recorded moving up to 2,000 m (approximately 6,500 ft) and male bats have been recorded moving up to 1,000 m (approximately 3,300 ft) between roost sites (Broders et al. 2006).

Evidence suggests that portions of the population of NLEBs move seasonally (see Section 3.3.5, *Dispersal and Migration*); little is known about migration, but studies are on-going (WEST 2016). For example, late summer swarming behavior and relatively high concentrations of bats at some caves indicate that there is some local or regional movement before reproduction occurs. Generally, NLEBs begin arriving at hibernacula in August, and by mid-September large numbers can be seen flying near the openings of certain caves and mines (Boyles et al. 2009). Most breeding happens during this fall swarming period.

3.3.3 Demographics

The January 2016 programmatic BO on the final 4(d) Rule for NLEB (USFWS 2016d) estimated that 1,137 maternity colonies occupy forested acres in Iowa during summer. This estimate was based on slightly more than three million forest acres in the State, a 41.7% occupancy rate adjusted for overlap with males, and an assumption of 405 forested ha (1,000 acres) per colony. Given that WNS has only recently been confirmed in Iowa, an average of 45 females per colony was used to generate a population estimate of 51,165 females. At a 1:1 sex ratio, this yielded an adult population of 102,330 NLEBs in Iowa. Similar to other bat species, NLEBs' reproductive rate is low, with female bats birthing one offspring per year. The sex ratio in NLEB populations appears to be skewed towards males, and multiple studies reported higher percentages of males compared to females, attributed to greater mortality among females (Griffin 1940, Pearson 1962, Hitchcock 1949, Stones 1981). The NLEB is a relatively long-lived species (Thompson 2006), with one individual reported living up to 19 years (Hall et al. 1957).

3.3.4 Range and Distribution

The NLEB is found in 39 states in the U.S., ranging from Maine to North Carolina on the Atlantic Coast, westward to eastern Oklahoma and north through the Dakotas, extending southward to parts of southern states from Georgia to Louisiana, and reaching into eastern Montana and Wyoming. In Canada, the species is found from the Atlantic Coast and west towards the southern Yukon Territory and eastern British Columbia (USFWS 2014). The winter and summer geographic ranges of the species appear to be identical (Barbour and Davis 1969).

3.3.5 Dispersal and Migration

NLEBs are considered regional migrants: short migratory movements between 56 km (35 miles) and 89 km (55 miles) from hibernacula to summer habitat are most common (Nagorsen and Brigham 1993 as cited in 78 Fed. Reg. 61,046 (2013), Griffin 1945). However, migratory movements of eight km (five miles) to 270 km (168 miles) have also been noted (Griffin 1945).

According to the *Northern Long-Eared Bat Interim Conference and Planning Guidance* (USFWS 2014), the main spring migration season is from the beginning of April to mid-May and the main fall migration season is from mid-August to October. Spring emergence is thought to occur earlier in more southern areas and fall migration is believed to occur earlier in more northern areas, similar to the pattern exhibited by INBAs (USFWS 2014). Even less is known about migration behavior of NLEBs than is known about that of INBAs on subjects such as flight heights, echolocation frequency, influence of weather, or whether they migrate singly or in groups. Of particular relevance to the Projects (see Chapter 4), data regarding the height at which NLEBs fly during migration are lacking. Bats are known to fly at higher altitudes when migrating in comparison to foraging flight heights (Cryan and Diehl 2009). However, there have been no radio-telemetry studies conducted to date on the migration behavior of NLEBs. To fill this information gap, a NLEB migration study was conducted in Iowa in fall 2015 as part of the Section 6 grant (see Section 5.2.2); radio-telemetry of 17 NLEBs found no clear pattern in direction travelled, but the bats appeared to be moving along or toward riparian areas, suggesting that NLEBs may follow creeks during migratory movements (WEST 2016).

Because 43 NLEB fatalities at wind energy facilities have been publicly documented to date, occurring primarily during late summer and fall,[5] it is clear that at least a portion of migrating NLEBs are flying above the tree canopy or investigating turbines at rotor-swept height during migration. However, data on species composition of fatalities observed at wind energy facilities within the range of the NLEB indicate myotids and TRBAs compose only about 10% of the total bat fatalities (USFWS unpublished data, as cited in USFWS 2015g). These data suggest that cave-dwelling bat species are probably not flying within the rotor-swept zone as frequently as long-distance migrating tree bats.

3.3.6 Species Status and Occurrence

Aspects of the life history of the NLEB make this species especially vulnerable to a variety of threats. The low reproductive rate of NLEBs makes it likely that populations will be slow to recover from the loss of individuals, which increases the possibility that mortality caused by WNS or other factors could cause local or regional extirpation (USGS 2009b). Although population trends have not historically been recorded for this species, it is understood that WNS is currently causing severe population declines in the eastern parts of the species' range. The combined effect of other sources of mortality may diminish the species' ability to persist in areas where populations are already significantly reduced by WNS.

[5] Kerns and Kerlinger 2004; Arnett et al. 2005; Stantec Ltd. 2007; James 2008; Grehan 2008; Jain et al. 2009, 2011; Jacques Whitford 2009; Young et al. 2009, 2013; Good et al. 2011; Kerlinger et al. 2011; Stantec 2011; J. Taucher, PGC, pers. comm.

3.3.6.1 Range-Wide

While the distribution of NLEBs is widespread, individuals are present in an irregular, patchy distribution. NLEBs rarely occur in large numbers (Barbour and Davis 1969), but are considered more common in the northern part of their overall range (Harvey 1992, CBD 2010).

Little information exists describing the overall population size or trends of NLEB. Although low numbers are characteristic of hibernacula counts (Schmidt 2001, CBD 2010), mist-netting surveys suggest that NLEBs are more numerous than indicated by hibernacula counts (Whitaker et al. 2002). Even though the population trends for NLEB were not historically monitored across the species' range, some surveys documented stable populations within portions of the species' range prior to the onset of WNS (e.g., Trombulak et al. 2001, CBD 2010).

As described in Section 3.2.1 for INBAs, WNS is the most severe threat facing populations of NLEBs across its entire range and is the primary reason the species was listed under the ESA (80 Fed. Reg. 17,973 (2015); USFWS 2015c). Populations of the NLEB in the northeastern U.S. and eastern Canada are estimated by the USFWS (80 Fed. Reg. 17,934 (2015)) to have declined by up to 99% since the discovery of WNS in 2007 (as determined from hibernacula counts before and after WNS). For example, Turner et al. (2011) reported a 98% decline in the number of hibernating NLEBs at 42 hibernacula in New York, Pennsylvania, Vermont, Virginia, and West Virginia by comparing the most recent counts from before and after the appearance of WNS. In Pennsylvania, NLEB populations declined by 99% due to WNS (Turner 2013 unpublished data as cited in 78 Fed. Reg. 61,046 (2013)). Francl et al. (2012) found a significant reduction (22.9%) in the capture rates of NLEBs after the arrival of WNS (2010) for mist-netting surveys in West Virginia.

Langwig et al. (2012) found that hibernacula with larger pre-WNS populations of NLEBs experienced greater declines, suggesting a density-dependent impact, based on hibernacula surveys of 14 populations of NLEBs surveyed in New York, Vermont, Connecticut, and Massachusetts. All 14 populations of NLEBs in the study became locally extinct within two years due to WNS, although some populations of other bat species affected by the disease stabilized at drastically reduced numbers compared to pre-WNS levels. As of August 2, 2016, WNS was confirmed in 29 states (White-Nose Syndrome.org 2016). The USFWS predicts that the disease will likely spread westward throughout the species' entire range within a short time, as it has already spread over 1,600 km (approximately 1,000 miles) since its initial discovery in New York in 2006 (80 Fed. Reg. 17,934 (2015)).

3.3.6.2 Iowa

The landscape of Iowa was historically dominated by tallgrass prairie with scattered areas of deciduous forest throughout (Auch 2007). Most of this landscape has been converted to cultivated agriculture. Currently, much of the forested habitat potentially used by NLEBs for roosting and feeding in the spring, summer, and fall exists in floodplain riparian forest, as well as smaller patches of remaining upland forest, located mostly in the southern and eastern portions of Iowa (Figure 3.6). NLEBs have recently been captured in 13 Iowa counties, mostly in the central and southeast parts of the state (McPeek 2015). NLEB acoustic surveys conducted in 2016 by the

IDNR indicated widespread distribution of NLEB across central and western Iowa by recording likely presence of the species at 82 of 120 sampling sites within 60 counties (Blanchong 2017).

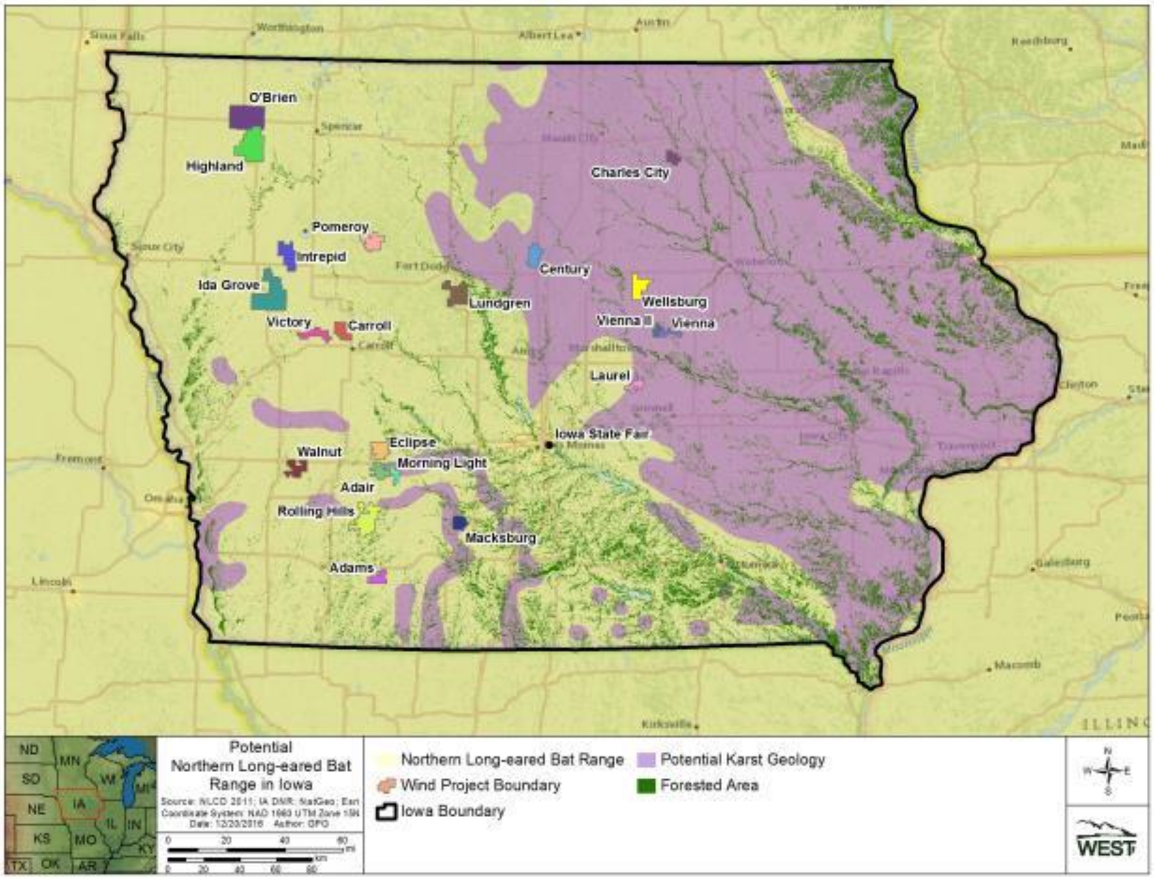

Figure 3.6. Forested Areas and Karst Regions in Iowa Representing Potential Summer Roosting and Foraging Habitat and Winter Hibernacula for the Northern Long-Eared Bat, Shown in Relation to the MidAmerican Energy Company's Projects.

Little is known about the location of hibernacula in Iowa for NLEBs. According to Dixon (2011) and Pruszko and Bowles (1986) many of the potential caves and mines that could be used as hibernacula occur in the eastern part of the state. NLEBs regularly hibernate in caves in eastern Iowa (Laubach et al. 1994 as cited in Dixon 2011). About 1,300 caves were documented in Iowa by the Iowa Grotto of the National Speleological Society (Kambesis and Lace 2009), of which as many as 90% are 50 m (164 ft) or less in length (Dixon 2009 as cited in Dixon 2011). This suggests that, due to their small size and potential to be overlooked compared to larger caves, many of these caves could be overlooked in assessments of bat populations in Iowa (Dixon 2011). MidAmerican and the IDNR sponsored surveys for potential bat hibernacula in February and March 2017 that used dogs trained in scent tracking to investigate areas with potentially suitable habitat for wintering bats. The surveys resulted in 19 locations along rock outcroppings within Madison, Boone, Mahaska, and Hardin counties in Central Iowa (Hurt 2017).

Some records of mist-netting efforts conducted in Iowa from 1965 to 1991 show that NLEBs have been present in Iowa in the last 50 years; a total of 147 NLEBs were captured in these studies (Bowles et al. 2009).

3.3.6.3 Project Site/Local Population

Based on historical and recent survey data NLEB are believed to occupy suitable habitat throughout the entire state of Iowa. Most of the Projects contain relatively small, isolated blocks of potential tree-roosting habitat, i.e., less than 81 ha (200 acres) of forest in total and less than 1% of the total Project area (Table 3.2). The maps in Appendix A show the forested habitat, i.e., potential summer habitat for NLEBs, at each Project.

Information is not available about species hibernation sites within or in the vicinity of the Projects. Based on information from Dixon (2011) and Pruszko and Bowles (1986), most of the potential caves and mines that might be used by hibernating NLEBs are located in the eastern and northeastern portion of the State, where glacial sediment is thinnest and cave-forming bedrock is close to the surface. However, "caves are also scattered throughout the central and southeastern sections where glacial sediments are thin or where major surface streams have cut into the bedrock" (Figure 3.6; Kambesis and Lace 2009). Karst, a landform underlain with soluble rock such as limestone that could form caves, occurs over the eastern half and parts of southwestern Iowa.

Table 3.2. Acres of Forest, Representing Potential Summer Habitat for Northern Long-Eared Bats (NLEB), within the MidAmerican Energy Company's Project Areas (Adapted from U.S. Fish and Wildlife Service Biological Opinion [McPeek 2015]).

Project Name	County	Total Project Area (hectares [acres])	Total Area of Potential Summer Habitat for NLEB (hectares [acres])
Rolling Hills	Cass, Adams, Adair	17,939.25 (44,328.85)	683.97 (1,690.12)
Macksburg	Madison	5,820.54 (14,382.86)	683.22 (1,688.26)
Highland	O'Brien	23,618.46 (58,362.48)	144.52 (357.12)
O'Brien	O'Brien	24,667.40 (60,955.61)	72.85 (180.01)[1]
Walnut	Pottawattamie	8,261.61 (20,414.89)	71.60 (176.93)
Intrepid	Sac, Buena Vista	11,221.71 (27,729.44)	70.86 (175.11)
Carroll	Carroll	6,573.31 (16,243.01)	62.17 (153.63)
Adams	Adams	5,341.32 (12,198.94)	51.36 (126.91)[1]
Lundgren	Webster	13,437.57 (33,204.95)	44.34 (109.57)
Laurel	Marshall	4,147.94 (10,249.79)	42.89 (105.99)
Adair / Morning Light	Cass, Adair	9,984.93 (24,673.29)	42.79 (105.73)
Eclipse	Guthrie, Audubon	8,117.07 (20,057.71)	32.58 (80.52)
Charles City	Floyd	4,724.32 (11,674.06)	31.30 (77.34)
Pomeroy	Pocahontas	8,570.78 (21,178.86)	29.02 (71.72)
Ida Grove	Ida	26,693.74 (65,962.89)	15.81 (39.07)[1]
Victory	Crawford, Carroll	7,336.72 (18,129.43)	11.12 (27.66)
Vienna	Tama, Marshall	6,684.88 (16,518.71)	10.37 (25.62)
Century	Hamilton, Wright	7,220.45 (17,842.13)	3.11 (7.68)
Wellsburg	Grundy	9,305.92 (22,995.42)	1.67 (4.13)

Note: Total Project areas may differ slightly from those presented in Table 2.1 and Section 3.1 due to differences in Geographic Information System software and land cover datasets used.

[1] NLEB potential summer habitat temporarily estimated by the amount of acreage in NLCD forested habitat categories within the Project boundary. Further analysis, consistent with the digitization method used for all other Projects, is underway.

Following USFWS guidelines (USFWS 2015a), MidAmerican compiled desktop habitat assessments for NLEB to determine total acreage of potential suitable habitat at each Project (Table 3.2; WEST 2016). Acoustic presence/probable absence surveys were then conducted in forested lands at the 18 operating Projects (all but Adams, Ida Grove and O'Brien) during spring and summer of 2015 (May 15 – July 31, 2015; WEST 2016). Consistent with recommended sampling rates in the *2015 Range-Wide Indiana Bat Summer Survey Guidelines* (USFWS 2015a), this survey effort included multiple acoustic survey sites at Projects where forest (potential NLEB habitat) is common, such as Macksburg and Rolling Hills (14 survey sites each; Table 3.3). The majority of Projects have limited potential NLEB habitat and only one or two survey sites were warranted, with Highland and Walnut warranting three survey sites each (Table 3.3).

Based on the results of the acoustic surveys conducted in 2015, spring and summer presence of NLEBs was confirmed at Lundgren, Macksburg, and Rolling Hills; the 2015 surveys indicated probable absence of NLEBs at the other 15 Projects (Table 3.3). NLEBs were also captured at Macksburg during mist-netting for the fall 2015 NLEB migration study; these captures included female and male adult and juvenile bats, indicating the presence of maternity colonies. At Lundgren, Macksburg, and Rolling Hills, calls of NLEBs were recorded at multiple stations, in several cases more than 4.8 km (3.0 miles) apart, indicating widespread distribution of NLEBs within the three Project areas. Using the 405-ha (1,000-acre) colony size applied in the BO on the final 4(d) Rule (USFWS 2016d) and rounding forested acres up to the next thousandth (see Table 3.2 for acreages), it is estimated that a minimum of five separate NLEB summer roost sites may be found within or nearby these three facilities (one at Lundgren, two at Macksburg, and two at Rolling Hills). With an average of 45 females per colony (USFWS 2016b), this suggests a population of 225 female bats.

Table 3.3. Number of Northern Long-Eared Bat (NLEB) Acoustic Survey Stations and Confirmed Presence within the MidAmerican Energy Company's Project Areas (WEST 2016).

Project Name	County	Number of Acoustic Survey Stations	NLEB Confirmed Presence?
Adair/Morning Light	Adair/Cass	2	No
Carroll	Carroll	2	No
Century	Hamilton/Wright	1	No
Charles City	Floyd	2	No
Eclipse	Guthrie/Audubon	2	No
Highland	O'Brien	3	No
Intrepid	Sac/Buena Vista	2	No
Laurel	Marshall	1	No
Lundgren	Webster	1	Yes
Macksburg	Madison	14	Yes
Pomeroy	Pocahontas	1	No
Rolling Hills	Cass/Adair/Adam	14	Yes
Victory	Crawford/Carroll	1	No
Vienna/Vienna II	Marshall/Tama	1	No
Walnut	Pottawattamie	3	No
Wellsburg	Grundy	1	No

Carrying the estimation further, and assuming a 1:1 female to male ratio (USFWS 2016b), the total estimated population of NLEBs in the surveyed areas would be 450 individuals.

Post-construction fatality monitoring conducted between December 1, 2014, and November 13, 2015, at nine of the Projects documented 907 bat fatalities of seven bat species, but no fatalities of NLEB were found (Bay et al. 2016a). Post-construction fatality monitoring conducted between November 16, 2015, and November 16, 2016, at 13 of the Projects documented 2,305 bat fatalities but no NLEB were found (Bay et al. 2017).

3.4 Little Brown Bat

The LBBA, sometimes known as the common house bat, is widely distributed over North America. As of 2006, a time when the population was known to be stable or slightly increasing, the population of LBBAs was estimated to be about 6.5 million (Frick et al. 2010). Since that time, WNS has been identified as the cause of great annual mortality to LBBAs in affected caves in the northeastern U.S., leading to population decreases from 30 to 99%, with a mean decrease of 73% (Frick et al. 2010). This trend indicates that the LBBA could be extirpated from its core range by 2026 (Frick et al. 2010). Due to these recent population reductions, the USFWS is gathering information and reviewing the listing status of LBBA under the ESA (USFWS 2011d, Kunz and Reichard 2010). Given the potential for listing and documented collision fatalities at wind turbines, LBBA is included among Covered Species in this HCP.

3.4.1 Life History and Characteristics

LBBA emerge from hibernation from mid-March to mid-May, depending on geographic location (Fenton and Barclay 1980). At this time, reproductive female bats typically return to natal day roosts and form maternity colonies that range in size from tens to hundreds of bats and are situated in dark, warm, and undisturbed locations such as attics, barns, tree cavities, etc. (Davis and Hitchcock 1965, Burnett and August 1981, Kalcounis and Hecker 1996, Crampton and Barclay 1998, Reynolds 1998, Frick et al. 2010). LBBAs use a separate night roost, also a confined space, between feeding sessions (Fenton and Barclay 1980, Whitaker et al. 2007, Kurta 2008). In this active season male LBBAs are thought to roost in smaller colonies and in cooler locations than reproductive females, sometimes even in hibernacula (Davis and Hitchcock 1965), although less is known about the habits of males in summer. LBBAs feed mostly on small aerial insects (Anthony and Kunz 1977).

Although mating occurs in the fall, fertilization of female LBBAs occurs in spring with stored sperm and within a few days following arousal from the hibernacula (Wimsatt and Kallen 1957, Buchanan 1987). Females give birth to a single pup 50-60 days later (Wimsatt 1945, Barbour and Davis 1969) and young are completely weaned at about 26 days after birth (Kunz et al. 1998).

In fall, as soon as early August, the summer colonies dissolve and LBBAs migrate to hibernacula where they come together to swarm and mate in the vicinity of the hibernacula before commencing hibernation (Davis and Hitchcock 1965, Fenton 1969, Thomas et al. 1979, Kunz et al. 1998). Swarming occurs from about August through October (Thomas et al. 1979). When temperatures decrease and few to no insects are available, LBBAs begin a period of hibernation lasting through the winter, typically in caves or mines having high humidity, often returning to the same locations year after year (Hitchcock 1949, Davis and Hitchcock 1965, Fenton 1970, Humphrey and Cope 1976).

3.4.2 Habitat Requirements

3.4.2.1 Winter Habitat

LBBAs hibernate in dense clusters in winter, most frequently on the walls and roofs of caves and mines having high humidity (Fenton and Barclay 1980). As discussed in Section 3.3.2.1 above, LBBAs hibernate together in the same caves with big brown bats, INBAs, NLEBs, and TRBAs (Mills 1971, Caire et al. 1979, Boyles et al. 2009).

3.4.2.2 Spring, Summer, and Fall Habitat

As suggested by their widespread distribution, LBBAs can be found in a variety of habitats during their active period, including fragmented agricultural landscapes and suburban areas (Fenton and Barclay 1980, Henderson et al. 2009). LBBAs are quick to use new roosts as long as they have the proper microclimate (Fenton and Barclay 1980). LBBAs forage for insects mainly over water, but also around agricultural areas, meadows, forests, and cliff faces; they use both forest clearings and more cluttered habitat, depending on intraspecific competition and flight ability (van Zyll de Jong 1985, Crampton and Barclay 1998, Boyles et al. 2009, Bat Conservation International 2015). Chances to forage may be more limited where wooded areas are fragmented as opposed to intact forests and the edges of older forests, both of which may have higher densities of insects (Patriquin and Barclay 2003).

Pregnant LBBAs can forage over an area greater than 30 ha (74.1 acres) but this area decreases after young are born, as females return to the roost to feed young (Henry et al. 2002). In New Brunswick, Canada, male LBBAs traveled an average distance of 275 m (902 ft) between successive roosts and used a total roosting home range of four ha (10 acres; Broders et al. 2006). In comparison, foraging areas were 254 m (833 ft) from roosting areas and total foraging areas covered 52 ha (128 acres).

3.4.3 Demographics

The range-wide population of LBBAs prior to the introduction of WNS was estimated at 6.5 million, based on long-term monitoring of 22 hibernacula in the northeastern U.S., an area considered to be the core range of the species (Frick et al. 2010). As with other species of bats, the rate of reproduction for LBBAs is relatively low; females give birth to one offspring per year at a 1:1 ratio of females to males (Griffin 1940, Wimsatt 1945, Barbour and Davis 1969). Annual survival of adults was 54% – 86% for a 16-year banding study in Kentucky and Indiana (Humphrey and Cope 1977). In a 15-year banding study at a hibernaculum in Ontario, the adult survival rate was 71% for females and 82% for males (Keen and Hitchcock 1980). Survival within the first year of life is thought to be lower. LBBAs are relatively long-lived, with one individual re-captured 30 years after being initially banded (Keen and Hitchcock 1980).

LBBAs are known to hibernate in many colonies of several thousand bats. As an example, 110 bat hibernacula are known to exist in Wisconsin, of which the largest three colonies collectively contain 275,000 LBBAs (Wisconsin Department of Natural Resources 2010).

3.4.4 Range and Distribution

The range of the LBBA extends over most of the U.S. and Canada, extending from Nova Scotia into southern Alaska, and south to southern California and northern Florida (Figure 3.7). Excluded from this range are most of the southern Great Plains region, parts of southern California, and most of Arizona, as well as New Mexico, Louisiana, Florida, and coastal regions of some states and provinces along the Atlantic Coast (Arroyo-Cabrales and Álvarez-Castañeda 2008). LBBAs are limited to regions having caves and mines with suitable temperatures and humidity for hibernation and compatible hibernation seasons (Humphries et al. 2002, 2006).

The largest populations of LBBAs are known to occur in the range of the Appalachian Mountains and the eastern Midwest, likely due to the high densities of caves in those regions (Culver et al. 1999). The largest known colonies at hibernacula are located in the northeastern and Midwestern U.S., with the northeastern U.S. considered the core range of LBBAs (Kunz and Reichard 2010).

LBBAs have been documented hibernating in caves in Iowa, with records from the following counties in northeastern Iowa: Clayton, Delaware, Fayette, Floyd, Jackson, Jones, and Winneshiek (Dixon 2010). MidAmerican's Charles City Project, located in Floyd County, is the only Project located in an Iowa county with known hibernating LBBAs. This species likely also uses caves in other locations in Iowa that that have not been studied (Dixon 2011).

Figure 3.7. The Range and Distribution of Little Brown Bat Shown in Relation to the MidAmerican Energy Company's Projects.

3.4.5 Dispersal and Migration

During spring migration, LBBAs appear to migrate in a radial pattern outward from hibernacula (Davis and Hitchcock 1965, Fenton 1970, Griffin 1970, Humphrey and Cope 1976). For example, LBBAs that hibernated in southern Vermont were later found in Connecticut, Massachusetts, New Hampshire, New York, and Rhode Island (Davis and Hitchcock 1965). Based on banding studies, this species is thought to migrate over several days, using transient roosts en-route, and travel as far as 455 km (283 miles) to summer roosts (Davis and Hitchcock 1965, Fenton 1970, Griffin 1970, Humphrey and Cope 1976).

As for NLEBs, data regarding the height at which LBBAs fly during migration are lacking. Because 1,039 LBBA fatalities at wind energy facilities have been publicly documented to date, occurring primarily during late summer and fall (from data compiled by WEST from source studies [Appendix B]), it is clear that at least a portion of migrating LBBAs are flying above the tree canopy or investigating turbines at rotor-swept heights during migration. However, data on species composition of fatalities observed at wind energy facilities within the range of the LBBA indicate myotids and TRBAs compose only about 12% of the total bat fatalities (from data compiled by WEST from source studies [Appendix B]). These data suggest that cave-dwelling bat species are probably not flying within the rotor-swept zone as frequently as long-distance migrating tree bats.

3.4.6 Species Status and Occurrence

Populations of LBBAs not yet exposed to WNS are considered relatively stable while those exposed to this disease are experiencing decreases (discussed further below; Frick et al. 2010). The population size of LBBAs in Iowa is not known, but 946 LBBAs are known to have been captured during mist-netting efforts conducted in Iowa from 1965 to 1991, showing that LBBAs have been present in Iowa in the last 50 years (Bowles et al. 2009).

LBBAs are susceptible to several other threats. These include disturbance by humans during hibernation, which can lead to arousal, injury, or death depending on the level of disturbance. Arousal may cause LBBAs to burn up fat reserves before insect food resources become available in spring, causing starvation and death (Thomas 1995). Loss of habitat is another threat. The removal of trees and conversion of wetlands and riparian zones to other habitat may harm LBBAs by removing or altering roost trees and foraging habitat and the connectivity among these habitats (Lookingbill et al. 2010). Even the removal of small forest patches in areas with relatively few roosting opportunities may be adverse to the species (Kalcounis et al. 1999). Conversely, clearing of forest can create new edge habitats for LBBAs to exploit.

LBBAs are susceptible to exposure to pesticides and pollutants. LBBAs can experience toxic effects directly from pesticides when sprayed for agriculture and residential uses (Geluso et al. 1976, Anthony and Kunz 1977, Clark et al. 1987, Fenton and Barclay 1980). They can also be affected indirectly when pesticides decrease their insect food supply (Kunz et al. 1977). Pollutants such as polychlorinated biphenyl, cyanide, and mercury also can adversely affect bats (Fenton and Barclay 1980).

3.4.6.1 Range-Wide

Until recently, the LBBA was considered common and widespread. Since the arrival of WNS to a single cave in New York, discovered in 2006, populations of LBBAs have undergone historic declines in the eastern U.S. and Canada and the disease has steadily progressed westward across the continent reaching Iowa, Minnesota, Missouri, and Oklahoma (Figure 3.1; White-Nose Syndrome.org 2016). Although several bat species have contracted WNS, the LBBA has experienced the greatest mortality (Frick et al. 2010). Between 2006 and 2009 alone, more than one million LBBAs are estimated to have died from WNS, about 15% of the estimated population prior to 2006 (USFWS 2012b). At 42 sites located in New York, Pennsylvania, Vermont, Virginia, and West Virginia, the cumulative decline due to WNS was estimated at 91% (Turner et al. 2011). More recently, some reports indicate that populations of LBBAs in Connecticut, Massachusetts, New York, and Vermont have maintained levels of 2% to 20% of pre-WNS population levels (Langwig et al. 2012). Possible reasons for this apparent population stabilization include lower densities of individuals, which discourages pathogen exposure; and the possibility that surviving individuals may harbor a natural resistance to the fungus, perhaps transmissible to offspring. The USFWS is currently gathering information about the LBBA and reviewing its listing status under the ESA (USFWS 2011d, Kunz and Reichard 2010).

3.4.6.2 Iowa

The LBBA population in Iowa has not been calculated by any studies currently available in the published literature. To provide a coarse estimate of the statewide LBBA population size, MidAmerican conducted a desktop assessment using Frick et al.'s (2010) range-wide population estimate of 6.5 million LBBAs, applied in several approaches that seemed theoretically reasonable to estimate the proportion of those bats that may occur in Iowa. Without evidence to support calculation of a variation in LBBA density, it was assumed that the density of LBBAs was approximately even across the species' range or across suitable habitat within the species' range. The approaches all followed the same general two-step methodology: (Step 1) a bat/acre density was calculated by dividing the 6.5 million-bat population estimate over a given area, and (Step 2) the Iowa population was calculated by multiplying the bat/acre density over a given area within Iowa. The approaches differed in how the area in each step was defined.

Four approaches were considered:

1. Step 1: divide 6.5 million LBBAs across the entire area of the five Northeastern U.S. states comprising the core LBBA range. Step 2: multiply the bat/acre density calculated in Step 1 by the entire area within the state of Iowa. Result: 2,879,394 LBBAs in Iowa.

2. Step 1: divide 6.5 million LBBAs across the entire area of the continental U.S. Step 2: multiply the bat/acre density calculated in Step 1 by the entire area acreage within the state of Iowa. Result: 118,496 LBBAs in Iowa.

3. Step 1: divide 6.5 million LBBAs across the USGS Gap Analysis Program (GAP)-defined species distribution acreage[6] of the five Northeastern U.S. states composing the core LBBA range. Step 2: multiply the bat/acre density calculated in Step 1 by the USGS GAP-defined species distribution acreage within the State. Result: 470,709 LBBAs in Iowa.

4. Step 1: divide 6.5 million LBBAs across the USGS GAP-defined species distribution acreage of the continental U.S. Step 2: multiply the bat/acre density calculated in Step 1 by the USGS GAP-defined species distribution acreage within the State. Result: 63,068 LBBAs in Iowa.

[6] http://gapanalysis.usgs.gov/species/data/.

The USGS GAP defines species distributions as the spatial arrangement of environments suitable for occupation by a species. In other words, a species distribution is created using a deductive model to predict areas suitable for occupation within a species' range. These species' distributions are then made available for use by the general public.

The highest and lowest estimates were deemed unlikely to be reasonable estimates of the LBBA population size in Iowa, but there is insufficient information to further assess whether the LBBA population may be nearer to 118,496 LBBAs or 470,709 LBBAs in Iowa. For the purposes of this HCP, the straight average of these two estimates, 294,603 LBBAs, is considered to be a reasonable coarse estimate of the LBBA population in Iowa based on the best available scientific information.

LBBA calls were recorded at 14 of the Projects during the 2015 acoustic surveys (WEST 2016), supporting the widespread occurrence of this species across Iowa. Post-construction fatality monitoring conducted between December 1, 2014, and November 13, 2015, at nine of the Projects documented 907 bat fatalities of seven bat species, 34 of which were LBBA fatalities (Bay et al. 2016a). Post-construction fatality monitoring conducted between November 16, 2015, and November 16, 2016, at 13 of the Projects documented 2,305 bat fatalities, 38 of which were LBBA fatalities (Bay et al. 2017).

3.5 Tri-Colored Bat

The TRBA is the smallest bat found in Iowa, weighing four to eight grams, measuring eight or nine cm (about three inches) from head to tail, and measuring 22 to 23 cm (about nine inches) from wingtip to wingtip (Fujita and Kunz 1984). A weak flier, it may occasionally be mistaken for a large moth (Harvey et al. 2011). Formerly in the genus *Pipistrellus* and known as eastern pipistrelle, it is now in the monotypic genus *Perimyotis*. Its common name refers to the color pattern of its hair, which is black at the base, yellow in the middle, and brown at the tip. TRBAs are also distinguished by their contrasting pink forearms against darker colored wing membranes. TRBAs are the first bats to hibernate in our region and the last to emerge from hibernation. This, combined with their propensity to select deeper parts of caves where ambient temperatures are relatively constant (Fujita and Kunz 1984), has made them particularly vulnerable to WNS. Large decreases in their numbers at hibernacula led to a petition to list the species as threatened or endangered (CBD and Defenders of Wildlife [DOW] 2016). Given the potential for listing and documented collision fatalities at wind turbines, the TRBA is included among Covered Species in this HCP.

3.5.1 Life History and Characteristics

In Missouri, LaVal and LaVal (1980) found that TRBAs entered the caves in which they hibernated earlier than most bats, in late July-August, and departed later, in late April-May. The large number of marked bats they recaptured during the August swarming period suggested strong fidelity to specific hibernacula. Fujita and Kunz (1984) reported that a number of researchers found TRBAs usually hibernating singly, selecting deeper parts of caves where ambient temperatures usually were relatively constant. Small clusters have also been reported (e.g., Sandel et al. 2001). Griffin (1940) found that males and females did not segregate during hibernation, but other researchers have found skewed sex ratios in caves, suggesting differences in male and female selection of hibernacula (Fujita and Kunz 1984).

In spring, TRBAs migrate from hibernacula to summer roosting sites. Documented migration distances range from 52.8 km (32.8 miles) (Griffin 1940) to extensive latitudinal migrations, with males prone to migrate longer distances than females (Fraser et al. 2012). There are also reports of males and non-reproductive females roosting in summer in hibernacula (Carter et al. 1999).

Females gather in maternity colonies in summer while males appear to roost singly (Fujita and Kunz 1984). Maternity colonies are generally small, averaging four individuals (Veilleux and Veilleux 2004a) to 15 individuals (Whitaker 1998). Roost fidelity among females appears to be high both within summers and between summers, and there is some evidence of fidelity to natal roost sites (Veilleux and Veilleux 2004b).

Mating among TRBAs occurs in fall and again upon ovulation in spring (Fujita and Kunz 1984). In fall mating, fertilization is accomplished with spermatozoa stored in the uterus until spring ovulation. Gestation lasts at least 44 days, after which a pair of pups is usually born. Parturition in Missouri was found to extend from early June to early July (LaVal and LaVal 1980), while in southern Indiana, it was recorded from late June to early July (Cope and Humphrey 1972). Young have been reported to fly at three weeks of age and achieve adult-like flight and foraging ability about one week later, with subadults arriving at hibernacula by early August (Fujita and Kunz 1984). Juvenile females reach sexual maturity in the first spring season following their parturition, usually by 11 months of age (Fujita and Kunz 1984).

3.5.2 Habitat Requirements

3.5.2.1 Winter Habitat

The TRBA hibernates in caves, mines, and other man-made structures, often in association with other species, such as INBA, NLEB, and LBBA (Fujita and Kunz 1984). In northeast Iowa, Dixon (2011) reported a preference for caves with vertical entrances (probably a function of the karst topography in which the caves occurred) and smaller caves (i.e., less than or equal to 50 m in length), but larger caves were also used. In Arkansas, Briggler and Prather (2003) found a preference for larger caves with east-facing aspects and an avoidance of caves on steep slopes. They found that larger caves on shallower slopes had a greater buffer capacity from weather conditions, a wider variety of temperature profiles within a season, and little variation between seasons, conditions that appeared to favor consistent use by TRBA.

3.5.2.2 Spring, Summer, and Fall Habitat

Fujita and Kunz (1984) cited various authors who documented maternity colonies in barns and other man-made structures, but use of trees, caves, and rock crevices was also noted. Subsequent radio-telemetry studies have changed this view to the extent that Harvey et al. (2011) stated that most TRBA roost in trees in summer and rarely occur in buildings. In Indiana, Veilleux et al. (2003) found all TRBAs roost in foliage, not in tree hollows, with oaks preferred. Upland habitats were preferred over riparian and bottomland habitats, possibly because oaks were better represented. Roost-site fidelity was greater in TRBA (3.9 days) than in eastern red (*Lasiurus borealis*) and Seminole bats (*L. seminolus*; 1.2-1.7 days), with which it was compared. The distances that TRBA traveled from roost areas to foraging grounds averaged 1.8 ± 0.1 km (1.1 ± 0.1 mile; maximum of 4.4 km [2.7 miles]). In North Carolina, O'Keefe (2009) found non-reproductive TRBAs roosting only in forest stands older than 72 years, mainly at lower elevations, and closer to non-linear openings and water than expected by chance. In Arkansas, Perry and Thill (2007) found that all 47 roosts recorded were in tree canopies, with 50% of female roosts and 91% of male roosts in dead leaves of deciduous trees, mainly oaks in mature (more than 50 years old) forest. Males selected tree sizes randomly, but females selected larger trees.

3.5.3 Demographics

There are no estimates of the range-wide population of TRBAs, but as discussed below (Section 3.5.6.1), data from the eastern U.S. suggest that the population of TRBA is at least an order of magnitude less numerous than LBBA. Females give birth to twins (Fujita and Kunz 1984). Hoying (1983) recaptured one known-age banded female that returned to its place of birth and subsequently gave birth to two normal-sized young. Based on this record, he estimated that sexual maturity was reached at three to 11 months of age. Fujita and Kunz (1984) caution, however, that attainment of sexual maturity in the first year may not be characteristic throughout the range of the TRBA, given latitudinal variation in attainment of first molt and bone ossification (epiphysis).

In a technical study that supported the listing of the TRBA as endangered in Canada, Forbes (2012) found that mortality in yearlings is high, while adults are long-lived (mean age of breeding individuals estimated at nine years), and females only produce one or two young every year or two. He emphasized that such a life-history strategy heightens vulnerability to high adult mortality rates, as can occur with WNS.

3.5.4 Range and Distribution

The TRBA occurs throughout most of eastern North and Central America and in parts of the Midwestern U.S. (Fujita and Kunz 1984). Iowa is at the western edge of its range, and the TRBA is considered absent from the northwest corner of the State (Figure 3.8).

Winter habitat is found in caves and mines. Caves documented as bat hibernacula in Iowa by the Iowa Grotto (a non-profit organization dedicated to the exploration, preservation, and study of Iowa caves) are restricted to the northeast corner of the State, specifically Clayton, Delaware, Dubuque, Fayette, Floyd, Jackson, Jones, and Winneshiek counties, where 38 caves containing hibernating bats were documented (Dixon 2010). Hibernating TRBAs were recorded in all of the above counties except Delaware County (Dixon 2010). MidAmerican Energy's Charles City Project, located in Floyd County, is the only Project located in TRBA winter range in Iowa. The species likely also uses caves in other locations in Iowa that have not been studied (Dixon 2011).

Summer habitat is woodland, where TRBAs have their maternity colonies and roost in trees (Section 3.5.2.2). In the Midwest, oak abundance correlated with greater abundances of TRBAs (Veilleux et al. 2003, Perry and Thill 2007). There was evidence in Indiana that upland habitats were preferred over riparian and bottomland habitats (Veilleux et al. 2003).

Woodland coverage is greatest in eastern Iowa along the Mississippi River and decreases westward (Leatherberry et al. 2006). What woodland there is, however, is generally highly fragmented by agriculture (Jackson et al. 1996). It is not clear how fragmentation affects TRBAs, but based on the recent acoustic survey sponsored by IDNR (Blanchong 2017), TRBA presence was likely across most of central and western Iowa, where woodland cover is relatively minimal in the state due to agriculture.

Figure 3.8. The Range and Distribution of Tri-Colored Bat Shown in Relation to the MidAmerican Energy Company's Projects.

3.5.5 Dispersal and Migration

The TRBA was thought to be a short-distance migrant between summer habitat and hibernacula (Fujita and Kunz 1984), but isotope analysis of fur samples points to a large proportion of individuals undertaking longer, latitudinal migrations (Fraser et al. 2012). A radio-telemetry study conducted in Indiana (Veilleux et al. 2003) found that the distances traveled from roost areas to foraging grounds averaged 1.8 ± 0.1 km (maximum of 4.4 km). Roost-site fidelity was also found to be greater in TRBAs than in other summer resident bat species.

Data regarding flight height of TRBAs during migration are lacking. Fatality statistics at wind-energy facilities shed some light, however. A total of 650 fatalities of TRBAs have been recorded to date, occurring primarily during late summer and fall (from data compiled by WEST from source studies [Appendix B]). This confirms that at least a portion of migrating TRBAs are flying above the tree canopy or investigating turbines at the rotor-swept height. The species composition of fatalities at wind-energy facilities within the species' range shows that myotids and TRBAs make up about 12% of bat fatalities (from data compiled WEST from source studies [Appendix B]). This suggests that cave-dwelling bats are probably not migrating at rotor-swept heights as frequently as tree-roosting bats.

3.5.6 Species Status and Occurrence

The USFWS is reviewing a June 2016 petition to list the TRBA as a threatened species under the ESA (CBD and DOW 2016). The large documented decline in numbers resulting from WNS was cited as the primary reason for listing. Additional threats cited were human disturbance at hibernation and root sites, wind energy, habitat loss, pesticides, and climate change (CBD and DOW 2016). Petition findings have not yet been made.[7]

3.5.6.1 Range-Wide

There are no estimates of the range-wide population of TRBAs, but in the eastern U.S., data suggest that its population size is an order or two less than the population of LBBAs. In a survey of hibernacula in New York, Pennsylvania, West Virginia, and Tennessee spanning 1999 - 2011, 68,148 TRBAs were counted in comparison with 982,974 LBBAs (Ingersoll et al. 2013). TRBA was 6.9% of the number of LBBAs counted in this study. Frick et al. 2010 estimated a range-wide population of 6.5 million LBBAs. Using this ratio applied to the LBBA estimate yields a range wide estimate for TRBA of 450,635. It is worth noting that, prior to the onset of WNS, TRBA numbers appeared to be on the decline (Ingersoll et al. 2013). Another survey (Turner et al. 2011) compared pre- and post-WNS counts at 43 hibernacula in New York, Pennsylvania, Vermont, Virginia, and West Virginia. It found a 75% decrease in the number of TRBAs, from 3,107 to 783. For LBBA, the decrease was 91%, from 348,277 to 30,260. In these comparisons, TRBA numbers were 6.9%, 0.9%, and 2.6% of the number of LBBAs, respectively, yielding an average of 3.5% of the number of LBBAs captured during the studies.

3.5.6.2 Iowa

The analysis detailed above for estimating the LBBA population (see Section 3.4.6.2) considered 294,603 LBBAs to be a reasonable coarse estimate of that species' population in Iowa based on the best scientific information. That value was the straight average of two reasonable estimates (118,496 and 470,709 individuals) that used different ways to calculate the bat/acre density of the continental population of LBBAs (6.5 million; Frick et al. 2010) and multiply them over given areas within Iowa. Using the average proportion of 0.035 TRBA to one LBBA in the studies cited above (Turner et al. 2011, Ingersoll et al. 2013), a corresponding reasonable coarse estimate of the Iowa population of TRBA is 10,311.

Acoustic survey data for NLEBs and LBBAs collected in 2016 under the Section 6 grant studies (Blanchong 2017) suggest that between 40% and 73% of the sites surveyed had likely TRBA calls recorded, depending on which analytical software was used to identify calls. Given that there are

[7] https://ecos.fws.gov/ecp/report/table/petitions-received.html (accessed January 18, 2017).

approximately 2.2 million acres of forested habitat in the state of Iowa (USGS NLCD 2011, Homer et al. 2015, McPeek 2015) between approximately 356,123 and 652,759 ha (880,000 and 1,613,000 acres) could be occupied by TRBAs at 40% and 73% occupancy. There is very little information regarding home range size of TRBAs, maternity colony size for TRBAs, and overlap of home ranges, but under the assumption that a typical home range size for TRBA is similar to other myotid species, then an assumption can be made that a single maternity colony may occupy approximately 247 ha (610 acres) (McPeek 2015). This would suggest that there could be between 1,443 and 2,644 discrete home ranges that could be occupied by a summer colony of TRBAs without overlap. Assuming a typical TRBA maternity colony has 10 individuals, this would equate to between 14,430 and 26,440 female TRBAs, or between 28,860 and 52,880 total TRBAs assuming a 1:1 sex ratio.

The recent acoustic survey data suggested that between 19% and 77% of the sites surveyed had likely LBBA calls (Blanchong 2017) depending on which analytical software was used to identify calls. This would suggest that TRBAs are similarly distributed across the surveyed areas as LBBAs and would suggest between a 2:1 and 0.95:1 occupancy ratio. The acoustic surveys may underestimate occupancy by LBBAs as the species will also occupy non-forested habitats, such as buildings and rural urban areas. However, it could be assumed from this data that TRBA occupancy is equal to that of LBBA and then it can be further assumed that the relative abundance of TCBAs on the landscape is similar, suggesting there would be at least 294,603 TRBAs in Iowa (see Section 3.4.6.2).

These three methods provide variable a TRBA population estimate ranging from 10,311 to 294,603 bats. While each method has limitations and assumptions, there is little direct information related to TRBA abundance. The 2016 acoustic data currently represents the best available information. The median between the lowest and highest estimates based on the acoustic data is approximately 161,731 bats, which is a reasonable estimate for further analyses.

TRBA calls were recorded at 15 of the Projects during the 2015 acoustic surveys (WEST 2016), supporting the widespread occurrence of this species across Iowa. Post-construction fatality monitoring, conducted at nine of the Projects between December 1, 2014, and November 13, 2015, documented 907 fatalities of seven species, 18 of which were TRBAs (Bay et al. 2016a). Post-construction fatality monitoring, conducted between November 16, 2015, and November 16, 2016, at 13 of the Projects documented 2,305 bat fatalities, 27 of which were TRBAs (Bay et al. 2017).

3.6 Bald Eagle

The bald eagle is a large raptor with a wingspan of 1.8 to 2.4 m (6.0 to 8.0 ft). Adult birds have white heads and tails, yellow beaks, and dark brown bodies. Immature eagles (during the first four to five years) have darker plumage with white splotches and brown beaks.

Although they prefer fish, bald eagles are opportunistic feeders and will hunt a variety of aquatic and terrestrial mammals, reptiles, amphibians, crustaceans, and birds. They will also scavenge for carrion, though this behavior is more commonly observed during winter months when other food sources may be limited.

Bald eagles have a life span of 20-30 years in the wild. Pairs tend to mate for life, returning to the same nest site year after year. The nest is usually built in an isolated, dominant tree with strong branches that is near water. The pair will defend about 2.5 square km (km^2; 1.0 square mile [mi^2]) surrounding it against any nesting competitors or predators. If their nest from the previous year is still there, the pair will simply add to it. As a result, nests can reach two m (seven ft) wide and three m (10 ft) deep and weigh as much as 1,800 kilograms (4,000 pounds). Bald eagles may build one or more alternate nests within their territory and may switch to an alternate nest in successive years, particularly after nesting failure (Buehler 2000). Generally in the Midwest, female bald eagles begin laying eggs near the end of February.

According to the USFWS Midwest-Region Bald Eagle Conservation website (USFWS 2015f), the following chronology is typical for reproductive activities of bald eagles within the Midwest, including Iowa:

- Nest building (late-January through March);
- Egg laying/incubation (March through May);
- Hatching/rearing young (April through July); and
- Fledging young (mid-June through August)

These are the time periods during which bald eagles are most sensitive to anthropogenic disturbances, with nest building considered to be the most critical period. After fledging, juvenile bald eagles usually roam up to 0.40 km (0.25 mile) from their respective nest location and are still dependent upon adults to feed them for approximately six weeks (USFWS 2007c).

The female lays two to three eggs at 4-day intervals. Both parents incubate, and after 35 to 40 days the eggs hatch. Young eagles fly for the first time when they are about 75 days old, and the young stay near the nest site up to five more weeks. By late summer, immature eagles learn to hunt and forage for themselves (IDNR 2010).

During the winter, eagles from northern states and Canada migrate south to find food. The birds begin arriving in Iowa during September and become more numerous through January. The highest concentration of eagles in the Midwest is along the Mississippi River. Each year, approximately 4,000 to 7,000 bald eagles winter along the Mississippi, from Minneapolis/St. Paul to 80 km (50 miles) south of St. Louis (IDNR 2010). In Iowa alone, the number of bald eagles wintering along the Mississippi ranged from 844 to 4,201 between 2011 and 2015 (IDNR 2012b, 2013, 2014, 2015a).

3.6.1 Habitat Requirements

Bald eagles are frequently found near water or other sources of food, such as carrion. Particularly in winter, bald eagles are typically found near aquatic areas with some open water for foraging. Ideal winter habitat generally includes an abundance of food, presence of roost sites to provide protection from inclement weather, and absence of human disturbance. Bald eagles will tolerate some human activity in areas of high prey availability, such as below hydroelectric facilities, other power facilities, or at locks and dams that keep rivers from freezing (Buehler 2000).

In addition to food resources, bald eagles need places to roost during the night and perch during the day. Bald eagles generally roost together in large mature trees surrounded by a buffer of smaller trees. Roosts are chosen by the eagles to provide protection from the weather and avoid disturbances. Roosts are also generally close to a source of food. Daytime perches are usually within 55 m (180 ft) of the water's edge. These perches are also generally located away from houses and roads (Buehler 2000).

3.6.2 Range and Distribution

The bald eagle historically ranged and nested throughout most of North America, with the exception of central and southern Mexico and extreme northern Alaska and Canada (USFWS 2009b). Today, bald eagles can be found in every U.S. state and Canadian province, with the largest breeding populations located in Alaska, the Great Lakes states, Maine, Chesapeake Bay area, Florida, the Pacific Northwest and the Greater Yellowstone Area. During winter, bald eagles that nest in northern latitudes often migrate to the south or to areas of open water; wintering eagles within the U.S. are most abundant in the Midwest and West (USFWS 2009b).

3.6.3 Species Status and Occurrence

The bald eagle population experienced declines starting in the late 19th Century, associated with hunting and other human effects, such as poisons (Buehler 2000, USFWS 2009b). The BGEPA was passed in 1940 to protect bald eagles (amended in 1962 to additionally protect golden eagle populations). Further declines to the species were associated with pesticides such as dichloro-diphenyl-trichloroethane (DDT), which became widespread starting in the 1940s. DDT significantly affected bald eagle populations because it accumulated in the bird's tissues and caused very thin eggshells, which resulted in unsuccessful reproduction (Buehler 2000, USFWS 2009b). A National Audubon Society survey estimated the number of breeding pairs in the lower 48 states to be 417 in 1963 (USFWS 2009b). In 1972, DDT was banned and in 1978, Congress listed the bald eagle under the ESA (Buehler 2000, USFWS 1978 [43 Fed. Reg. 6,230 (1978)]); over time, these protections resulted in the population rebounding. Bald eagles were subsequently de-listed from the ESA in 2007 due to their recovered status (USFWS 2007b; 72 Fed. Reg. 37,346 (2007)).

3.6.3.1 Range-Wide Populations

The USFWS estimated that the 2007 population exceeded 9,700 breeding pairs in the lower 48 states (USFWS 2009b). In 2009, the USFWS estimated that the population of bald eagles within the United States was approximately 155,474, approximately 86,550 of which are in Alaska (USFWS 2009b).

For wintering eagles, information gathered along 844 survey routes in 44 of the lower 48 states show that counts of wintering eagles has increased nationally, at an estimated rate of 0.6% per year between 1986 and 2010 (Eakle et al. 2015). The highest upwards trend of eagles counted was in the northeast (defined as north of 40º North and east of 100º West, which includes Iowa), where an increase of 3.9% per year was documented between 1986 and 2010 (Eakle et al. 2015).

3.6.3.2 Iowa

In Iowa, eagle nests have been reported in all of 99 counties (IDNR 2015c). There were 427 bald eagle nests documented as "active" by the State, and 196 nests with an activity description of unknown within the Iowa state border according to 2015 nest data provided by the IDNR. Assuming that the number active nests range somewhere between 427 and 623 (which assumes all unknown status nests are active), and applying the conversion factors for the Great Lakes Region as provided in the 2009 Final Environmental Assessment (FEA) for the Eagle Take Permit Rule to obtain an estimated bald eagle population size (per demographic data in Millsap and Allen 2006, and Millsap et al. 2004; Table C-3 of 2009 FEA), the estimated breeding population size in Iowa ranges from 3,416 to 4,984 bald eagles.

Many thousands of bald eagles migrate through and winter in the state as well (IDNR 2010). The number of bald eagles that winter in Iowa has been generally increasing, with an estimated increase of 4.3% per year (adult eagles; 4.1% per year for juveniles) between 1986 and 2010 (Eakle et al. 2015). The 10-year average number of eagles counted during the midwinter surveys in Iowa between 2007 and 2016 was 2,726 (IDNR 2016), with the highest number of eagles recorded in 2014, at 4,957 (IDNR 2014). The most recent midwinter counts have shown a drop in bald eagle observations: 2,375 in 2015 (IDNR 2015a) and 1,939 in 2016 (IDNR 2016). The 2016 numbers are the lowest recorded since 2003. Overall, the trend indicates bald eagle populations may be flattening with wide year-to-year fluctuations in wintering bald eagle populations in Iowa (IDNR 2016). Preliminary indications are that the midwinter counts completed in the winter of 2017 are closer to the historic average and higher than the 2016 counts (S. Shepherd, IDNR, pers. comm. 2017).

Historically, counts have been highest along the Mississippi River; however, in some recent years, including this year, the count has been higher along the Des Moines River (43.2%) when compared to the Mississippi River (25.5%). Previous years with higher occurrence include 2010, 2011, and 2013, with more eagles counted along the Des Moines River than any other river in the State. While a vast majority of eagles observed during all of these midwinter surveys are associated with the Des Moines and Mississippi rivers, a fair number of eagles can be found in river systems located in between these two major rivers (e.g., 21.5% of eagles were found along the Iowa, Skunk, Wapsipinicon, Turkey, South Maquoketa, Maquoketa, and Cedar rivers in 2016). Similar to the overall count of eagles, the geographic distribution trend appears to fluctuate year to year, with all years showing a large majority of eagles along the Mississippi River and Des Moines rivers and other rivers composing a lower proportion of eagle observations (range: 9.7% to 31.3% (IDNR 2012b, 2013, 2014, 2015a). Percent ice cover along the rivers likely drives at least some of the geographic distribution (IDNR 2014).

3.6.3.3 Project Site/Local Population

Local Area Population

The USFWS revised eagle rule considers the LAP for bald eagles to be the population located within a natal dispersal distance of 138 km (86 mi; USFWS 2016b). To determine the LAP for the Permit Area, a 138-km (86-mile) buffer was placed around the 22 covered Projects, which resulted in a total area of approximately 219,823 km^2 (84,874 mi^2; Figure 3.9). The USFWS estimates that the density of bald eagles within the Mississippi River Flyway is 0.017 eagles per square kilometer (0.045 eagles/mi^2), resulting in an estimated bald eagle LAP of 3,819 bald eagles.

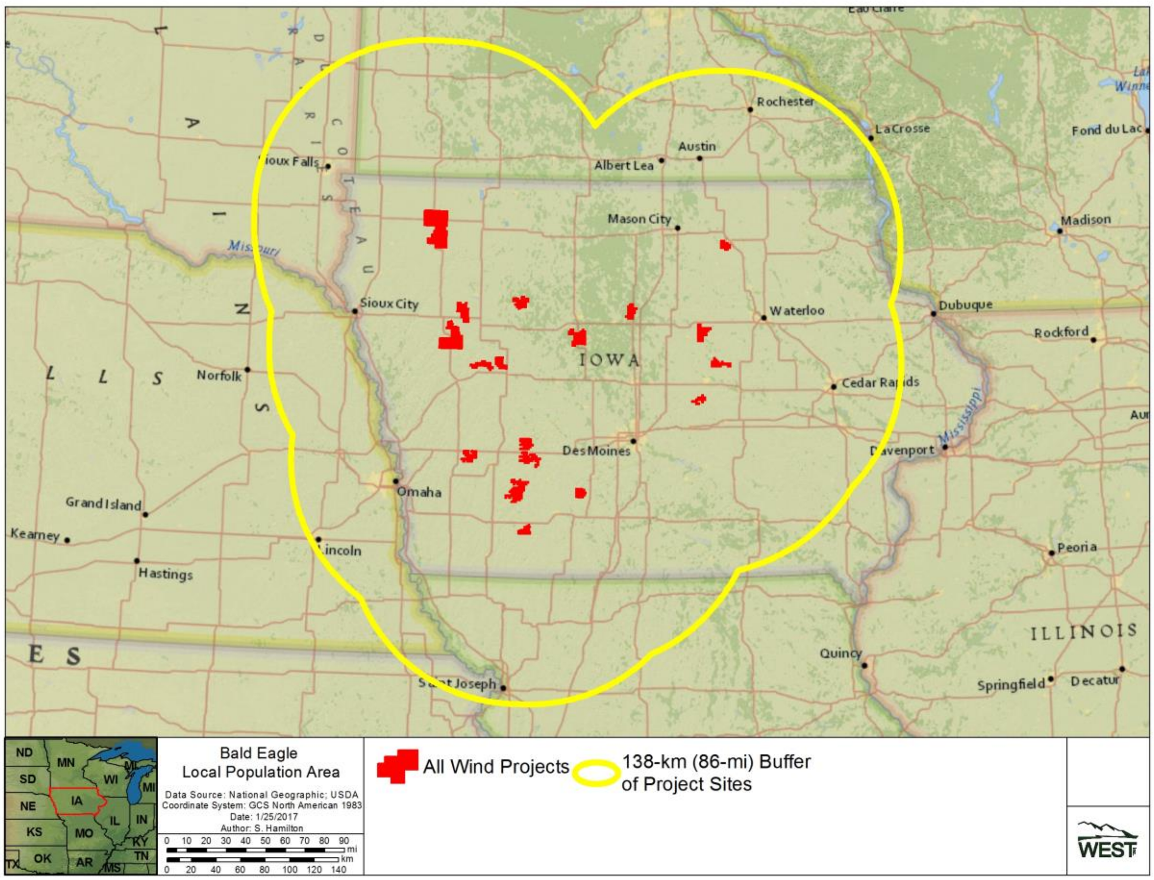

Figure 3.9. The 138-kilometer (86-mile) Local Area Population Buffer (Bald Eagle Local Area Population) for the MidAmerican Energy Company's Projects.

Project-Specific Eagle Use

Monthly eagle and avian use surveys commenced in December 2014 and proceeded through February 2016 at all of the Projects operating at the time (18 Projects). Sixty-minute surveys were completed at 800-m (2,625-ft) radius point count locations; survey coverage included a minimum of 30% of Project areas; and each point count location was visited once per month. Surveys followed guidance in the ECPG (USFWS 2013a). A more detailed discussion of the findings of the Project-specific avian use studies is included in Simon et al. (2016). The monitoring strategy was developed in consultation with the USFWS to meet their requirements.

Across all of the Projects, eagle use was highest during the winter months. During the spring, summer, and fall months, eagles were only rarely observed in the Projects. Eagle use varied amongst the Projects, with the highest use at the Macksburg and Rolling Hills sites (Figure 3.10), where there is far more forest/wooded cover than any of the other operating Projects.

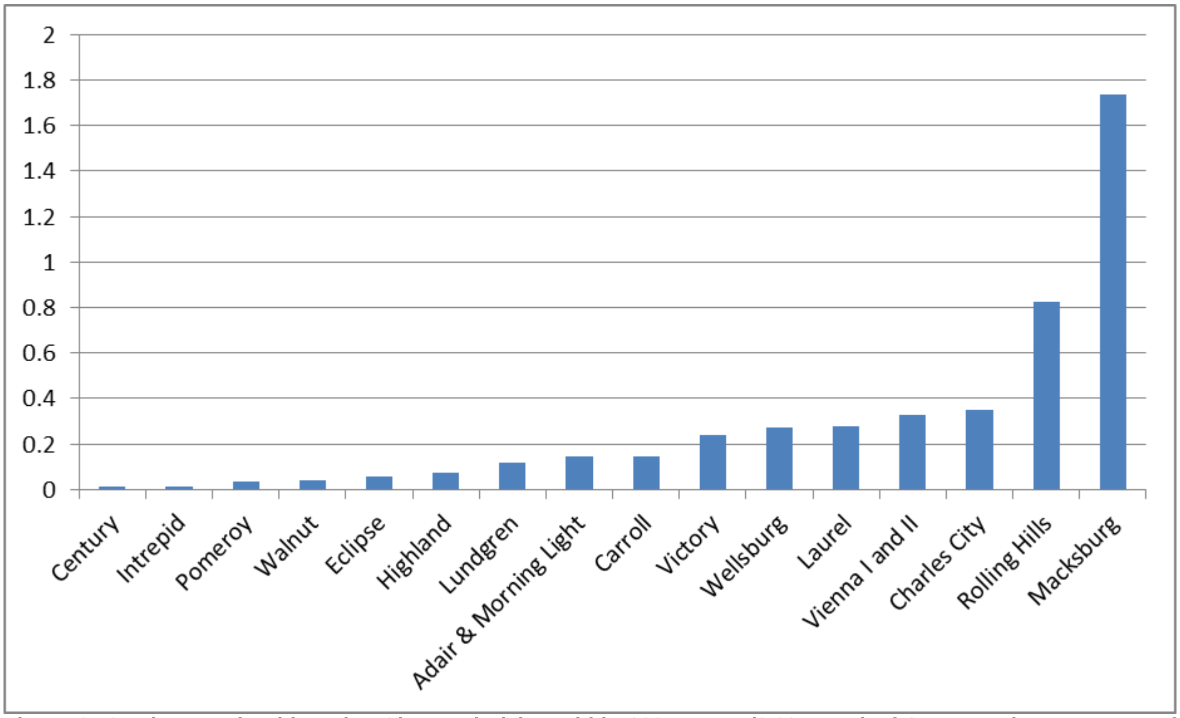

Figure 3.10. Minutes of Bald Eagles Observed Flying within 800 Meters (2,625 Feet) of Survey Points per Hour of Survey at the MidAmerican Energy Company's Projects (December 2014 through February 2016).

In addition to the avian use survey points within Project footprints, an equal number of reference points were also studied during the high eagle-use periods (November-February). These reference points were selected to be in similar habitats and within 1.6 to 4.8 km (1.0 to 3.0 miles) of the Projects. Over the course of two winters, eagle use at the reference points outside of the Project boundaries was on average about 71% higher than eagle use within the Projects (14 of the 16 geographically unique reference sites had higher use outside than inside the Projects). While bald eagles do not completely avoid wind farms, this suggests a reduced level of use in areas with operating wind turbines.

Project-Specific Eagle Nests

Eagle and raptor nest surveys were also conducted at 18 of the 22 Projects in 2015.[8] The nest surveys were developed in consultation with USFWS to meet their requirements. Aerial surveys of eagle/raptor nests were completed in March and April 2015 at all of the Projects operating at

[8] Three of the facilities covered in this HCP, Adams, Ida Grove and O'Brien, were under construction in 2016 and are not included in this report. The single turbine at the State Fair was also excluded from the study.

the time. MidAmerican Energy surveyed within Project areas and a 3.2-km (2.0-mile) buffer for bald eagle nests; additionally, areas characterized as likely suitable nesting habitat (e.g., historically known nest sites, wooded riparian corridors, wildlife management areas) within eight km of Project areas were surveyed for eagle nests.

A total of 25 bald eagle nests were documented at 11 of the Projects (Chodachek et al. 2015). The majority (21 of the 25) of the documented bald eagle nests were located greater than 3.2 km from the Projects, and none of the bald eagle nests were documented within any of the Project areas. This is likely due to the lack of quality nesting habitat and the limited prey resources within each of the Project areas. More suitable bald eagle nesting habitat exists along forested riparian corridors located farther than 3.2 km from the Projects. Bald eagle nests were primarily located along the larger rivers (i.e., North Raccoon River – Carroll Wind Energy Facility; Little Sioux River – Highland Wind Energy Facility; Des Moines River – Lundgren Wind Energy Facility) or larger bodies of water, which were typically farther than 3.2 km from the Projects (see maps provided in Chodachek et al. 2015).

4.0 IMPACT ASSESSMENT

This chapter describes potential direct and indirect effects of the Covered Activities and quantifies anticipated take that may arise from those effects. The ESA Section 7 implementing regulations (50 C.F.R. § 402.02) define "effects" as those direct and indirect effects of an action on the Covered Species (or its critical habitat), together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline. The USFWS also recommends that the potential direct and indirect effects of a project that are not expected to result in take provide context for the take assessment and assist the USFWS in expediting and satisfying the requirements of the ESA Section 7 process (USFWS 2016c).

4.1 Direct and Indirect Effects Not Expected to Result in Take

4.1.1 Direct Effects

Direct effects are the results of a proposed action that occur at the same time as the action. For the purposes of an HCP, direct effects are a proximate consequence of the proposed Covered Activities.

4.1.1.1 Maintenance

Maintenance activities conducted at the Projects such as turbine maintenance, road grading, O&M facility repair and upkeep, grounds upkeep, and SCADA upgrades, are not expected to lead to impacts that result in take. Maintenance of turbines involves periodic activities typically conducted inside turbines or the O&M building. Occasionally, a crane may be required to access the rotors or nacelles for maintenance activities. These types of activities do not present hazards to bats or eagles because the affected turbines are shut down for maintenance activities. Maintenance work does not generate excessive noise or other activity that could lead to disturbance of Covered Species potentially roosting or nesting within or near the Project. Routine maintenance activities are conducted during daylight hours, a time when the Covered Bat Species are typically not active.

Vehicles occasionally can strike eagles and other migratory birds. However, O&M vehicles that travel throughout the Projects during routine maintenance activities travel at low speeds. MidAmerican's policy for maintenance personnel requires vehicles traveling on Project access roads to travel at no more than approximately 15 miles per hour. Measurable hazards to eagles are exceedingly low and not expected to result in take.

It is unlikely that tree removal will be necessary for regular maintenance activities, aside from potential emergency tree removal, given the location of the Project infrastructure away from trees and the low amounts of forest cover in the Projects. Emergency tree removal of hazard trees that pose an imminent risk to human life and property may be conducted as needed. MidAmerican Energy will notify the USFWS in advance of emergency tree removal activities if such removal has the potential to impact the Covered Species (e.g., if the tree is a potential roost tree). If such impacts are foreseeable, MidAmerican Energy will notify USFWS and, if appropriate, have a qualified biologist conduct an emergence survey at the tree(s) requiring removal following the USFWS' Emergence Survey Protocol (Appendix C).

Currently, bald eagles are not known to actively nest near turbines at the Projects; there are no known bald eagle nests within Project boundaries or a 0.8-km buffer area (Chodachek et al. 2015). Given baseline activities at the Projects and background agricultural activities in the area, bald eagles that potentially could nest in the area in the future are expected to be tolerant to human activities. Nevertheless, MidAmerican Energy will ensure that any emergency tree removal associated with the Projects would avoid the removal of bald eagle nest trees and known roost trees. If disturbances to new eagle nests could occur, MidAmerican Energy will notify the USFWS and develop an appropriate nest conservation plan (including timing restrictions and/or "no activity" buffers) to avoid activities that would result in take of this Covered Species.

4.1.1.2 Decommissioning

Each of the Projects may be decommissioned at the end of its useful life. This may occur sooner than the end of the Permit term, depending on when a Project was built and whether it will be repowered to extend its useful life. The decommissioning process will include the dismantlement and removal of Project facilities from the site. Decommissioning activities occur during daylight hours and would not create hazards for active bats or eagles. During the decommissioning process, turbines would be locked to prevent blades from spinning, which would avoid the potential for collision with spinning turbines. It is unlikely that tree removal will be necessary for decommissioning activities; however, if there is any tree removal necessary for decommissioning to be completed during the protective timeframes for any Covered Species, the same procedures will be followed as described above for maintenance. Decommissioning of the Project is therefore not expected to cause direct or indirect effects that would result in take of Covered Species.

4.1.1.3 Operation

In addition to other direct effects that may result in take (discussed in Section 4.2, Section 4.3, and Section 4.4), operation of the Projects has the potential to result in effects to migrating or foraging individuals of the Covered Species if bats or eagles are forced to take an alternate route to avoid a wind energy facility (i.e., displacement). However, empirical data indicate bats are not being displaced by wind energy facilities due to the presence of bat fatalities found under turbines and through direct observations. By observing bat flight activity using thermal infrared cameras at wind energy facilities, researchers have documented bats flying and foraging in close proximity to wind turbines and even investigating spinning turbine blades (Ahlén 2003, Horn et al. 2008). Acoustic bat and mist-netting studies at the Projects indicated that bats were present even though turbines were operating nearby (WEST 2016). Similarly, eagles have been actively observed using the Projects, although the level of use is reduced in some cases compared to similar habitats outside of the Project areas, suggesting some avoidance or displacement is occurring (Simon et al. 2016). These minimal displacement effects are not expected to result in impacts rising to the level of take of any of the Covered Species.

4.1.1.4 Mitigation

Implementation of the HCP will include measures to mitigate for the impacts of the take (see Section 5.3). Because the mitigation measures are intended to provide conservation benefits to the Covered Species and other wildlife, they are not expected to result in effects that would lead to take, and are expected to result in beneficial effects to the Covered Species.

4.1.2 Indirect Effects

Implementing regulations of the ESA (50 C.F.R. § 402.02) define indirect effects to be those that are caused by the proposed action, but later in time and are reasonably certain to occur.

4.1.2.1 Maintenance and Decommissioning

Maintenance and decommissioning activities are not expected to result in indirect effects that would occur later in time. It is unlikely that tree removal will occur during regular maintenance or decommissioning activities, given the location of Project infrastructure away from trees and the relatively low amounts of forest cover in the Projects; thus, indirect effects from these activities, such as habitat loss, are unlikely to result in indirect effects through loss of habitat. If trees need to be removed during the Permit term, procedures will be followed as described above for maintenance (Section 4.1.1.1).

4.1.2.2 Operation

Operation of the Projects is not expected to result in indirect effects to the Covered Species that are a result of the action and occur later in time.

4.1.2.3 Repowering

MidAmerican Energy plans to repower up to 706 GE turbines at seven Projects (see Section 2.2.1.1 and Table 2.3). It is anticipated that repowering activities would occur from 2017 through 2020. The repowering process is not expected to have any direct effects on the Covered Species. The existing foundations, supporting tower structures, and underground collection systems would be used and would not require modification. The replacement components would consist of longer blades, and a replacement hub and all or parts of the gearbox and turbine nacelle assemblies. The repowering process would require construction of crane stabilization pads and equipment laydown areas near each turbine. Temporary crane paths will be constructed between repowered turbines and will employ avoidance measures described in Section 5.3, which would not allow the removal of any suitable habitat for the Covered Species during the active season. These components are not likely to affect the Covered Species as repowering activity will generally be limited to areas around turbines or on existing roads (e.g., delivery of components). In addition, repowering activities will largely be confined to daylight hours so as not pose disturbance to the Covered Bat Species. Impacts to bat species from operation of the turbines (after repowering is complete) are discussed in Section 4.2.

4.1.2.4 Mitigation

Implementation of the HCP will include measures to mitigate the impacts of the take. Indirect effects from the mitigation, those reasonably expected to occur but later in time, for example, increases in survival and elimination of future threats, are expected to be beneficial effects as the mitigation projects become established on the landscape and provide conservation benefits to the Covered Species and other wildlife.

4.1.2.5 Repowering

Repowering of the Projects (see Section 2.2.1 and Table 2.3) is not expected to result in indirect effects to the Covered Species. Repowering consists of modification of the existing turbines and does not require any additional land conversion or tree removal. Impacts from operation of the turbines are discussed in Section 4.2 and Section 4.3.

4.2 Take of Covered Bat Species

4.2.1 Overview

Operation of the turbines is the only activity occurring at the Projects that may result in take of the Covered Species. The methodology used to estimate potential take of the Covered Bat Species prior to implementation of minimization measures is provided in Appendix D. MidAmerican estimates that incidental take of the Covered Bat Species will be reduced by approximately 35% annually[9] with the implementation of minimization measures (see Chapter 5).

Three methods were used to establish a potential range of take for the Covered Bat Species, based primarily on the post construction monitoring data collected at 20 of the 22 facilities[10] in 2015 and 2016 (see Bay et al. 2016a, 2016b, 2017 for details on the post-construction monitoring studies): species composition method (SCM), evidence of absence (EoA), and a hybrid approach utilizing species composition to inform evidence of absence (IEoA). Species composition assigns a proportion of the overall estimated bat mortality for all of the Projects to the different species of

[9] The actual amount of take may be higher than this estimate because curtailment studies conducted at a number of wind projects indicate that blade feathering below the manufacturer's cut-in speed may reduce take from approximately 35% to 57% (Baerwald et al. 2009, Young et al. 2011, Good et al. 2012).

[10] Two of the facilities covered in this HCP, Ida Grove and O'Brien, were under construction in 2016 and were monitored in 2017.

bats found based on the percent composition (ratio) of each species in the pool of fatalities. The EoA approach is both a statistical framework and a software package developed by the USGS. EoA uses project monitoring data to estimate the likely take of Covered Species for a project or fleet based on the Multiple Class module. IEoA uses estimates derived from SCM to inform the fatality prior distribution within the EoA model software to improve take estimate precision. All three take estimation methods provided statistically similar results with overlapping confidence intervals. The estimates produced from the IEoA method were the most precise and meet the best available scientific information standard (Appendix D).

MidAmerican requests take authorization up to the upper bound of the 90% confidence interval for each of the Covered Bat Species after accounting for the estimated reduction due to the minimization measures (Table 4.1). The upper bound of the 90% confidence interval minus 35% is termed "Authorized Take." MidAmerican will implement the HCP, including funding mitigation, at the point estimate (the mean or mid-point of the confidence interval) for each Covered Bat Species after accounting for the estimated reduction due to the minimization measures, termed "Implementation Take" (Table 4.1). The difference between Implementation Take and Authorized Take accounts for uncertainty in take estimates, as Covered Bat Species populations in Iowa are expected to exhibit effects and recovery from WNS. Assigning these take levels also accounts for geospatial variability in estimating take across the Iowa landscape. MidAmerican's adaptive management protocol, described in Section 5.5, identifies triggers and responses to take between the Implementation and Authorized levels.

Table 4.1. Summary of Annual and Term Covered Bat Species Take Estimates Based on the Informed Evidence of Absence Approach.

	Indiana Bat	Northern Long-Eared Bat	Little Brown Bat	Tri-Colored Bat
Annual Unminimized Take (point estimate)	15	13	985	596
Implementation Take (35% reduction from Unminimized Take)	10	9	640	387
Annual Unminimized Take (upper bound of 90% CI)	38	33	1,133	706
Authorized Take (35% reduction from Authorized Take)	25	21	736	459
Implementation Take Permit Limit (30 years)	**300**	**270**	**19,200**	**11,610**
Authorized Take Term Limit (30 years)	**750**	**637**	**22,099**	**13,774**

Annual mortality can be expected to vary from year to year due to natural fluctuations in factors such as abundance, weather and seasonal patterns, and variables that may influence exposure to turbines such as prey availability and weather variables. MidAmerican Energy will monitor the amount of take annually through the ITP compliance monitoring and, if adaptive management thresholds are exceeded, MidAmerican Energy will implement additional mitigation measures and may implement changes in operational minimization measures to ensure that take is reduced in future years and the overall Permit limit is not exceeded (see Chapter 5 for adaptive management protocols).

4.2.2 Indiana Bat Take

MidAmerican Energy estimates the potential take of up to 750 INBAs over the 30-year life of the permit, based on the estimated annual take of 25 INBAs, after the 35% reduction due to minimization measures. This take estimate is supported by the following:

- No INBA fatalities were found during the 2015 monitoring studies at the Projects. One INBA fatality was found at the Macksburg Project during the 2016 monitoring studies.

- Only 10 INBA fatalities have been found range-wide at other wind facilities over the last eight years (Pruitt and Okajima 2018; A. Schorg, USFWS, pers. comm. 2017).

- According to the USFWS' NLEB 4(d) Rule Biological Opinion (USFWS 2016d), 8,934 carcasses of all bat species have been reported in the Midwest region, which is only a portion of the INBA range. Using just this information, the 10 INBA fatalities represent less than 0.1% of all known bat fatalities within the INBA range.

- The range of the INBA in Iowa is primarily in the southeastern third of the State, which has less wind development compared to other parts of the State. In addition, wind development currently only overlaps the western and northern edges of the species range in Iowa. The density of INBAs at the edges of its range is likely less than the density in the center of the species' range in Iowa.

- INBA in Iowa likely migrate southeasterly toward known hibernacula in Missouri, meaning INBAs would be migrating away from the Projects in the fall.

- Eight Projects plus the single turbine at the Iowa State Fair occur within the range of the INBA in Iowa and the OCRU; these Projects include a total of 568 turbines.

- Due to WNS, the population of INBA is in decline. While WNS effects have likely not been fully realized in Iowa at this time, it is expected that the species will continue to decline unless a cure is found. As a result, fewer INBAs would potentially be exposed to wind development in Iowa over time. The potential impacts of WNS on INBAs are addressed in Changed Circumstances (Chapter 8).

4.2.3 Impacts of the Taking of Indiana Bats

The impact of the take generally refers to the effect that loss of individuals has on their population or the species. Determining the impact of take therefore requires an understanding of population demographics and a prediction of the class(es) to which taken individuals likely belong, as well as a definition of the population being impacted. Notably, take of a female bat has a greater impact on the population than take of a male bat because female take results in lost reproductive potential. To understand the biological impact of the take on INBA populations, it is necessary to estimate what proportion of INBAs taken are likely to be reproductive females.

It is currently unknown, based on available scientific information, if there are sex-related factors that might influence risk of turbine collision for bats. Empirical data are unclear regarding the sex ratios of *Myotis* bats found in mortality monitoring studies, or for all bat species generally, largely because many carcasses cannot be identified to age or sex due to decomposition and scavenging by insects. The sex of bat carcasses found has been reported in 50 publicly available mortality monitoring studies in the eastern and Midwestern U.S. and Canada.[11] Among 5,860 carcasses of all bat species, 22%, 41%, and 37% were identified as females, males, and unknown sex, respectively. For *Myotis* species specifically, among 460 *Myotis* carcasses, 18%, 40%, and 42% were identified as females, males, and unknown sex, respectively. Since such a large percentage of bats could not be identified to either sex (42%), it remains unclear whether or not males made up the majority of fatalities. If unidentified bats were divided equally among the two sexes, the ratio of females to males for all bat fatalities, which is highly influenced by non-*Myotis* species, would have been skewed towards males (39% females and 61% males).

The geographic location of the Permit Area indicates that INBAs occurring within the eight Projects in the species' range may be mostly females. Female *Myotis* bats disperse from hibernacula to join summer maternity colonies while male *Myotis* bats typically remain closer to hibernacula throughout the summer (Gardner and Cook 2002, Whitaker et al. 2002, USFWS 2007a). The nearest known INBA hibernacula to the Projects in Iowa are located in Dubuque County on the eastern edge of the State along the Mississippi River (USFWS 2007a). In addition, Marion, Pike and Boone counties in northeastern Missouri have hibernacula (USFWS 2007a). In 2012 a new Priority 1 hibernacula was discovered in northeast Missouri (USFWS 2015g, McPeek 2015). Most of the female INBAs occupying summer habitat in and around the Projects are expected to be migrating to and from these locations in the spring and fall. Therefore, if collision risk is generally equal for both sexes, the majority of INBA fatalities at the eight Projects within INBA range are likely to consist of female bats due to their greater likelihood of occurrence within the eight Projects. Adding support to this is the fact that all but two of the nine INBA fatalities documented to date, where the sex has been able to be determined, have been females.

Based on data from genetic, banding and telemetry studies, MidAmerican anticipates that INBAs migrating through the Project areas belong to the OCRU population (USFWS 2007a). Thus, MidAmerican evaluated the impacts of the taking as they pertain to the OCRU population and at the range-wide population level. Little information is available about the local or regional INBA population sizes. It is likely, with the presence of a Priority 1 hibernacula in northeast Missouri which houses over 167,000 INBAs in the winter (USFWS 2015b), and the much smaller hibernacula sizes for the other hibernacula in Iowa and northeast Missouri (all Priority 3 or 4 hibernacula (USFWS 2007a), that a large portion of the INBAs that would occupy the Permit Area

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[11] Barton I and II, Blue Sky Greenfield, Buffalo Mountain 2000-2003, Buffalo Mountain 2005, Buffalo Ridge (2000), Buffalo Ridge (Phase II; 2001/Lake Benton I), Buffalo Ridge (Phase III; 2001/Lake Benton II), Buffalo Ridge I (2010), Buffalo Ridge II (2011), Casselman (2008), Casselman (2009), Cohocton/Dutch Hill (2009), Cohocton/Dutch Hills (2010), Criterion (2011), Crystal Lake II, Elm Creek, Elm Creek II, Fowler I, II, III (2010), Fowler I, II, III (2011), Grand Ridge I, Lakefield Wind, Lempster (2009), Lempster (2010), Locust Ridge II (2009), Locust Ridge II (2010), Mars Hill 2008, Moraine II, Mount Storm 2009, Mount Storm 2010, Mount Storm 2011, Mount Storm Fall 2008, Munnsville 2008, Noble Bliss 2009, Noble Clinton 2009, Noble Ellenburg 2009, NPPD Ainsworth, Pioneer Prairie I (Phase II), Prairie Winds ND1 (Minot), Prairie Winds ND1 (Minot) 2011, Prairie Winds SD1 (Crow Lake), Prince Wind Farm (2006), Rugby, Sheldon (2010), Sheldon (2011), Stetson Mountain I (2011), Stetson Mountain II (2010), Wessington Springs (2009), Wessington Springs (2010), Winnebago, Wolfe Island Report 2 (July-December 2009). See Appendix B for references.

in the summer could be from the Priority 1 hibernacula. This population was used as the regional population on which to assess the impacts of the taking.

Based on the assumptions that female adult INBAs are more likely to occur within the eight Projects in INBA range and that the fall migrating juveniles (i.e., young of the year) occur at a 1:1 sex ratio (although the exact proportion at birth of females to males is unknown), MidAmerican Energy believes that a 3:1 ratio of female to male bats potentially taken is a reasonable estimate. Therefore, approximately 75% of the INBAs that may be taken at the eight Projects within INBA range are expected to be female bats. This ratio may be an overestimate of the proportion of take attributable to female INBAs, but it represents a conservative[12] approach for assessing the impact of take on the population.

MidAmerican Energy estimates that an average of 25 INBAs may be taken each year during the 30-year ITP term after the minimization measures are implemented. Approximately 75% of the incidental take is expected to be attributed to females, which would result in an average annual take of 19 female INBAs. Using the USFWS' *Region 3 Indiana Bat Resource Equivalency Analysis Model for Wind Energy Projects* (USFWS 2016e) and assuming a stationary population, the total estimated lost reproductive capacity resulting from the take is 1,069 female INBA pups, resulting in a total estimated impact of 2,153 female INBAs (take of 563 female INBAs + lost reproduction of 1,069 female INBA pups = 1,632 total lost female INBAs) over the 30-year ITP term. Collectively, female take and lost reproductive capacity of females represents the annual loss of approximately 54 female INBAs per year over the 30-year ITP term.

The annual loss of 54 female INBAs equates to an approximate 0.02% reduction of the 2015 population of 243,142 INBAs in the OCRU (USFWS 2015a) and an approximate 0.03% reduction of the 2015 population of 167,000 INBAs in the Priority 1 hibernacula (USFWS 2015a). If the OCRU population of INBAs was reduced by 80% as a result of WNS, the loss of 54 INBAs per year represents 0.1% of the WNS-reduced population of 48,628. The loss to the range-wide population would be 0.01%, based on the 2015 estimated population size of 523,636 INBAs (USFWS 2015a).

These losses represent small fractions of the regional, OCRU, and range-wide INBA populations. Given the expected minimal impact of anticipated take on overall population levels, and because mitigation actions are expected to fully offset the impacts of take, the expected take from the Covered Activities will not have a significant impact on populations of INBA at the current population levels.

4.2.4 Northern Long-Eared Bat Take

MidAmerican Energy estimates the potential take of up to 637 NLEBs over the 30-year term of the ITP, based on the estimated annual take of 21 NLEBs, after the 35% reduction due to minimization measures. This take estimate is supported by the following:

- No fatalities of NLEBs were found during the 2015 or 2016 monitoring studies.

[12] Conservative means actual proportion of females to males in taken bats may be less (nearer to 2:1 or 1:1) and consequently the impact of take on the population may be less than assessed in this analysis and compensated for by the mitigation.

- Only two fatalities of this species have been reported from publicly available monitoring studies in Iowa.

- Post-construction monitoring studies at wind energy projects throughout the species range generally show that the risk to the NLEB is low. Only 43 NLEB fatalities have been publically reported (USFWS 2015g), which represents less than 0.1% of the total number of reported bat fatalities.

- The majority of the known NLEB fatalities were detected during the late summer and fall seasons. This suggests that the risk to the species may be highest when they move away from the summer maternity habitat during fall migration.

- Based on the methods used to estimate take (see Appendix D), the lack of fatalities in the database has the effect of lowering the estimates in the evidence of absence model below those in the species composition approach. The IEoA approach generates a take estimate between the other two estimates but overall, all three methods predict low take numbers.

Due to WNS, the population of the NLEB is in decline. While WNS effects have likely not been fully realized in Iowa at this time, the expectation is that the State population will likely continue to decline. As a result, fewer NLEBs would potentially be exposed to wind development in Iowa over time. The potential impacts of WNS on NLEBs are addressed in Changed Circumstances (Chapter 8).

4.2.5 Impacts of the Taking of Northern Long-Eared Bat

It is currently unclear based on available scientific information if there are sex-related factors that might influence risk of turbine collision for bats. Prior to the onset of WNS NLEBs were a common bat species that was a rare fatality recorded at wind projects. Information on the sex of carcasses was not collected in most cases and patterns related to sex of carcasses for NLEBs are generally not available.

Although little is known about the location of NLEB hibernacula in Iowa and range-wide, caves and mines that could be used as hibernacula occur in eastern and northeastern Iowa (see Section 3.3.6.2). These areas are located away from most of the Projects; however, caves are scattered throughout the central and southeastern parts of Iowa. Karst, a landform underlain with soluble rock such as limestone, can lead to the formation of voids, sinkholes, and caves, and occurs over the eastern half and parts of southwestern Iowa, in the vicinity of several Projects (Figure 3.6). Due to the potential for undocumented NLEB hibernacula to occur throughout Iowa and based on the species' widespread distribution in the State (Section 3.3.6.2), MidAmerican Energy believes it is reasonable to assume that male and female NLEBs are equally likely to occur throughout the Permit Area. If collision risk is generally equal for both sexes, NLEB take at the Projects is also likely to affect male and female bats equally.

It is currently unknown, based on available scientific information, if there are sex-related factors that might influence risk of turbine collision for bats (see discussion in Section 4.2.3).

Conservatively assuming that male and female adult NLEBs are equally likely to occur within the Permit Area and assuming that the young-of-the-year (juveniles) occur at a 1:1 sex ratio, and although the exact proportion of female to male births is unknown, it is believed that a 1:1 ratio of female to male bats potentially taken is a reasonable assumption. Therefore, approximately 50% of the NLEBs that are taken at the Projects are expected to be female bats.

MidAmerican Energy estimates that approximately 21 NLEBs may be taken each year during the 30-year ITP term. Approximately 50% of the incidental take is expected to be attributed to females, which would result in an average annual take of 11 female NLEBs. Using the USFWS' *Region 3 Northern Long-Eared Bat Resource Equivalency Analysis Model for Wind Energy Projects* (USFWS 2016f) and assuming a stationary population, the total estimated lost reproductive capacity resulting from the take is 599 female NLEB pups, resulting in a total estimated impact of 914 female NLEBs (take of 315 female NLEBs + lost reproduction of 599 female NLEB pups = 914 total lost female NLEBs) over the 30-year ITP term. Collectively, female take and lost reproductive capacity of females represents the annual loss of approximately 30 female NLEBs per year over the 30-year ITP term.

Little is known about overall population size of the NLEB. Small population size is characteristic of recorded occurrences (Schmidt 2001, CBD 2010). For example, hibernating groups are usually comprised of fewer than 50 bats (NatureServe 2015). Across the species' range, broader-scale population decline associated with habitat loss and disturbance to hibernacula has been noted (NatureServe 2015), while within portions of its range, some surveys report stable populations (e.g., Trombulak et al. 2001; CBD 2010). The January 2016 Programmatic BO on the final 4(d) Rule estimated the Iowa population at 102,330 adults (USFWS 2016d). This estimate is considered a pre-WNS estimate, given that WNS has only recently been confirmed in Iowa (White-Nose Syndrome.org 2016).

The annual loss of 30 female NLEBs equates to an approximate 0.03% reduction of the estimated population of 102,330 NLEBs in Iowa (Section 3.3.6.2), the NLEB population most likely to be impacted. If the estimated Iowa population of NLEBs was reduced by 80% as a result of WNS, the loss of 30 NLEBs per year represents 0.1% of the WNS-reduced population of 20,466. This loss represents a small fraction of the estimated Iowa population of NLEBs. The loss to the range-wide population cannot be reliably calculated given the range of population estimates and uncertainties caused by WNS; however, the impact would be less than the impact calculated for the Iowa population, as the range-wide population is by definition greater than the Iowa population.

Given the expected minimal impact of Project take on overall population levels, and because mitigation actions are expected to fully offset the impacts of take as well, MidAmerican Energy does not expect the take to have a significant impact on either the estimated Iowa or range-wide populations of NLEB at the current population levels.

4.2.6 Little Brown Bat Take

Based on the best available scientific information, MidAmerican Energy estimates the potential take of up to 736 LBBAs per year on average at current LBBA population levels, after the 35%

reduction due to minimization measures. Assuming LBBA populations decline by 80% due to WNS within approximately five years of the ITP, average LBBA take would be about 147 bats per year. However, the actual population declines that may occur due to WNS over the ITP term are uncertain. Due to this uncertainty, MidAmerican Energy proposes the take of 736 LBBAs per year over the 30-year ITP to be authorized in the ITP. Changed Circumstances (Chapter 8) will be used to address the potential change in status and future decline of LBBA due to the impacts associated with WNS.

4.2.7 Impacts of the Taking of Little Brown Bats

It is currently unclear based on available information if there are sex-related factors that might influence risk of turbine collision for bats. Because LBBAs were a common species prior to the onset of WNS, information on the sex of carcasses was not always collected and varying carcass condition made it difficult in many cases to determine sex. Patterns related to sex of LBBA carcasses are not available for current post-construction monitoring data.

Little is known about the location of LBBA hibernacula in Iowa. Caves and mines that could be used as hibernacula occur in eastern and northeastern Iowa (see Section 3.3.6.2). These areas are located away from most of the Projects; however, caves are scattered throughout the central and southeastern parts of Iowa (Figure 3.6). Due to the potential for undocumented LBBA hibernacula to occur throughout Iowa, and based on the species' widespread distribution in the State (Section 3.4.6.2), it is reasonable to assume that male and female LBBAs are equally likely to occur within the Permit Area. Therefore, if collision risk is generally equal for both sexes, LBBA take at the Projects is likely to affect male and female bats roughly equally.

It is currently unknown, based on available scientific information, if there are sex-related factors that might influence risk of turbine collision for bats (see discussion in Section 4.2.3). Conservatively assuming that male and female adult LBBAs are equally likely to occur within the Permit Area and assuming that the fall migrating juveniles (i.e., young-of-the-year) occur at a 1:1 sex ratio, and although the exact proportion at birth of females to males is unknown, it is believed that a 1:1 ratio of female to male bats affected by take is a reasonable assumption. Therefore, approximately 50% of the LBBAs that are taken at the Projects are expected to be female bats.

Assuming no reduction to the LBBA population, and approximately 50% of the incidental take is expected to be attributed to females, this would result in an average annual take of approximately 368 female LBBAs. Using the USFWS' *Region 3 Little Brown Bat Resource Equivalency Analysis Model for Wind Energy Projects* (USFWS 2016g) and assuming a stationary population, the total estimated lost reproductive capacity resulting from the take would be approximately 39,392 female LBBA pups, resulting in a total estimated impact of 50,432 female LBBAs (take of 11,040 female LBBAs + lost reproduction of 39,392 female LBBA pups = 50,432 total lost female LBBAs) over the ITP term. Collectively, female take and lost reproductive capacity of females represents the annual loss of approximately 1,681 female LBBAs per year over the 30-year ITP.

The annual loss of 1,681 female LBBAs equates to about 0.6% reduction of the estimated population of 294,603 LBBAs in Iowa (Section 3.4.6.2), the LBBA population most likely to be impacted. Based on a pre-WNS range-wide population size of LBBAs of 6.5 million (Section 3.4), the annual loss of 1,686 female LBBAs equates to an approximate 0.03% reduction of the range-wide population.

Given the expected minimal impact of Project take on overall population levels and since mitigation actions are expected to fully offset the impacts of take, it is not expected that the Projects would have a significant impact on either the State-wide or range-wide populations of LBBAs at current population levels.

4.2.8 Tri-Colored Bat Take

Based on the best available scientific information, MidAmerican Energy estimates the potential take of up to 459 TRBAs per year on average at current TRBA population levels, after the 35% reduction due to minimization measures. If its population continues to decline as a result of WNS, average annual take would be expected to decrease. Assuming TRBA populations decline by 80% due to WNS within approximately five years of the ITP, average TRBA take would be about 92 bats per year. Given uncertainty about future population effects of WNS, MidAmerican Energy proposes to set take at 459 TRBAs per year over the 30-year ITP. Changed Circumstances (Chapter 8) will be used to address future status changes and declines of TRBA resulting from WNS.

4.2.9 Impacts of Taking Tri-Colored Bats

The sex ratio of fatalities may influence the impact of take, particularly if females are over-represented in fatalities. However, it is unclear, based on available information, whether sex-related factors influence risk of turbine collision in bats, including TRBAs. This is because data on the sex of bat carcasses is generally lacking, either because it was not collected or because carcass condition made it difficult to determine sex.

Hibernacula location could conceivably influence the sex ratio, if sex ratios at hibernacula are skewed, as has been reported for TRBAs (see Section 3.5.1). Nonetheless, there are not enough data to say with any certainty that females are more or less likely to collide with wind turbines based on the location of particular hibernacula. Moreover, little is known about the locations of TRBA hibernacula in Iowa. Documented caves used as hibernacula are limited to northeastern Iowa (see Section 3.5.4). Only one Project, Charles City in Floyd County, is located in a county with documented TRBA hibernacula. However, karst topography also occurs in central and southeastern Iowa, thus, there is some likelihood that TRBAs winter near other Projects.

Given these uncertainties, it is assumed that male and female adult TRBAs are equally likely to occur within the Permit Area. It is also assumed that fall-migrating juveniles (i.e., young-of-the-year) also occur at a 1:1 sex ratio, because specific gender ratio data are lacking. Therefore, approximately 50% of the TRBAs taken at the Projects are expected to be female bats.

Assuming that approximately 50% of take is females, this would result in an average annual take of approximately 230 female TRBAs. Currently, there are no Resource Equivalency Analysis models for TRBAs. The annual loss of 230 female TRBAs equates to about 0.1% reduction of the estimated population of 161,731 TRBAs in Iowa (Section 3.5.6.2), where impacts are likely to be focused. The annual loss of 230 female TRBAs equates to an approximately 0.05% reduction of the estimated population 450,635 TRBAs range-wide (Section 3.5.6.1).

Since mitigation actions are expected to fully offset the impacts of take, it is not expected that the Projects would have a significant impact on either the State-wide or range-wide populations of TRBAs at current population levels.

4.3 Bald Eagle Take Estimation

4.3.1 Overview

Operation of the Projects is the only activity that may result in take of bald eagles and the only activity for which take of eagles is authorized and calculated in this HCP. The methodologies and calculations used to estimate potential take of covered bald eagle is discussed in more detail in Appendix D.

4.3.2 Bald Eagle Take

MidAmerican Energy conservatively estimates potential take of up to 10 eagles per year (300 over the proposed 30-year Permit term) at the covered Projects. This represents a number approximately 10% higher than the upper 80% confidence interval using the Project-specific exposure and collision model (see Method 2: MidAmerican Collision Risk Model, Appendix D). MidAmerican proposes to use this model because the Project-specific results represent the best data available and provide a take estimation that best represents the Projects. Although recent midwinter eagle counts done by the IDNR suggest bald eagle populations during the winter may be leveling off (see Section 3.6.3.2), MidAmerican increased the take estimate by approximately 10% to account for some growth in bald eagle populations at least through a portion of the permit term and to account for the impacts of repowering up to 706 turbines. Accordingly, these estimates are likely conservative and would not likely be exceeded.

4.3.3 Impacts of the Taking of Bald Eagles

To understand the biological impact of the take on bald eagles from Covered Activities, it is necessary to evaluate the impact of the predicted take at the population level. In the 2009 FEA Eagle Take Permit Rule (USFWS 2009b), the USFWS evaluated the level of take that could be permitted based upon the predicted ability of the populations to support take (i.e., USFWS established take thresholds up to which bald eagle take could be permitted that were "consistent with the goal of stable or increasing breeding populations"). This section evaluates the predicted level of bald eagle take from Covered Activities in relation to bald eagle population status and the take thresholds as established by the USFWS.

In the 2009 FEA, the USFWS determined that since bald eagle populations were increasing, annual take levels of 5% of annual production would be sustainable for bald eagles. Bald eagles are currently being managed at national, regional, and local area scales; however, the 2009 FEA only evaluated and set sustainable take levels at the EMU (regional) scale. The Great Lakes EMU, the area covered under the 2009 Eagle Rule, covers the same geographic extent as the Plan Area under consideration in this HCP. Within the Great Lakes EMU, the USFWS established annual individual take thresholds at approximately 224 individual bald eagles (5% of estimated annual production within the EMU (approximately 4,488 bald eagles). The average annual requested level of take for the Covered Activities is 10 individuals, or approximately 0.2% of the 2009 estimated annual production for the Great Lakes EMU.

The revised eagle rule manages eagles at the EMU, which is now defined by flyways. The Plan Area is within the Mississippi Flyway, an area where the estimated bald eagle population is 27,334 eagles and allowable annual threshold for take is 1,640 eagles (USFWS 2016h). The average annual requested level of take for the Covered Activities is 10 individuals, or approximately 0.03% of the estimated Mississippi Flyway EMU population.

The USFWS approach to managing bald eagles evaluates take thresholds based on estimates of bald eagle populations and annual production at the EMU scale; however, there is a considerable increase in the number of bald eagles into the Great Lakes EMU or Mississippi Flyway during the migration and winter season. Within Iowa alone, 4,957 wintering bald eagles were documented in 2014 (see Section 3.6.3.2), and thousands migrate through the State in spring and fall. The migratory and wintering bald eagles are not considered part of the resident population and are not included in the population estimates or the estimates of annual production.

The seasonal breakdown of use by bald eagles (Figure 4.1) suggests that less than 3% of potential take[13] is anticipated during the summer breeding season, while the majority of potential take (77%) is anticipated during the winter.

[13] The bald eagle fatalities found to date at the Projects have been in found December, February and March.

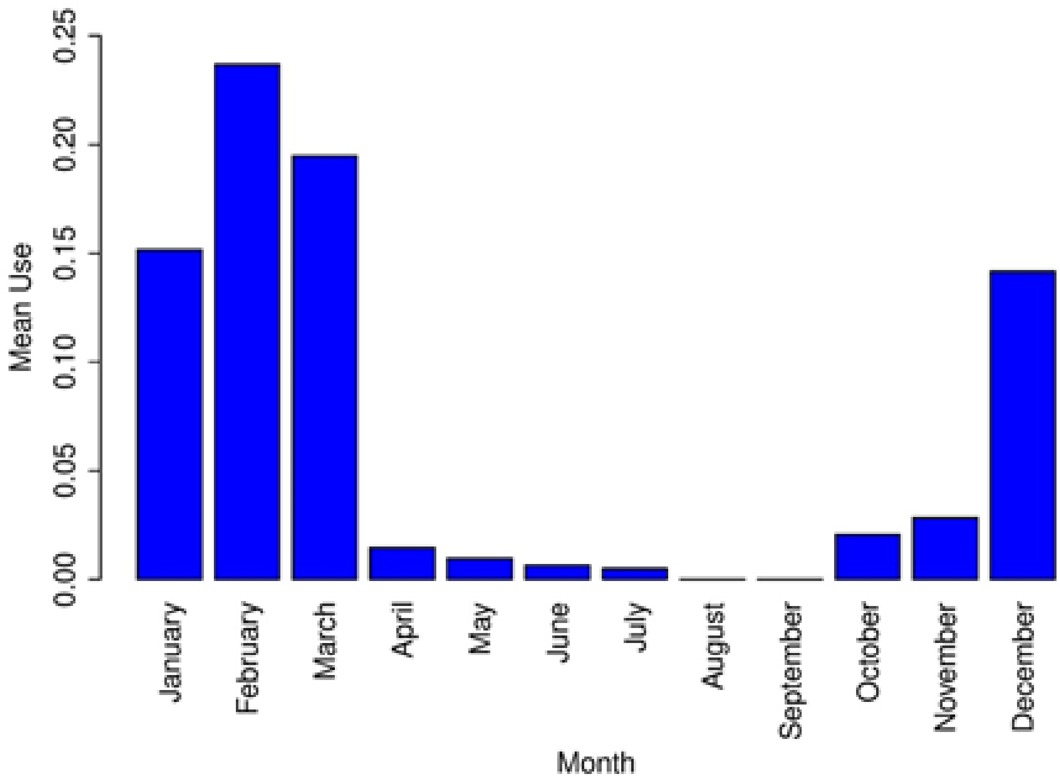


Figure 4.1. Mean Bald Eagle Use for All Survey Points Combined by Month within the Project Area for the 18 MidAmerican Energy Company's Wind Energy Projects studied from December 2014 to February 2016 (Simon et al. 2016).

While the annual post-2009 FEA baseline bald eagle take request for the Plan Area of up to 10 bald eagles per year are within the allowable take thresholds under either the 2009 Eagle Rule or the revised 2016 Eagle Rule, it is anticipated that many of the bald eagles that will be taken will be migratory or wintering bald eagles. The number of resident bald eagles that are expected to be taken is lower than the overall take request of 10 bald eagles per year and the evaluation presented herein is conservative (i.e., overestimates the impact of take) in that it evaluates the potential impacts of the overall take predictions against the resident bald eagle population and annual production estimates for resident bald eagles in the Great Lakes EMU or Mississippi Flyway. While many of the eagles found in Iowa are coming from the northern reaches of the Great Lakes management unit or Mississippi Flyway in Minnesota or Wisconsin, some of the eagles are coming from Canada, where the breeding populations are also relatively large and healthy.

4.3.3.1 Cumulative Impacts

The 2009 FEA evaluated sources of anthropogenic bald eagle mortality. Sources of anthropogenic bald eagle mortality may include aircraft collisions, take associated with housing developments, commercial developments, transportation, energy exploration and development (including fluid minerals, coal and other mining, geophysical exploration, pipelines and transmission corridors, power plants, and hydroelectric), timber harvest, communication towers, non-energy mining, agricultural- and habitat-related activities, recreation, military training, poisoning, collisions (wires, vehicles, wind turbines), shooting, and trapping. According to the 2009 FEA, in 2006 and 2007 there were 147 technical assistance actions (a measure of potential take) for bald eagles within the Great Lakes EMU. There was an estimated annual average of one individual bald eagle take authorized under ESA based on data from 2002-2007 and an estimate of average annual depredation/hazing permit authorizations of eight individual bald eagles during the same time period.

Based on the cause of mortality for 1,553 bald eagles in the Great Lakes EMU, the leading cause of human caused mortality was lead, pesticide, and other poisoning (333 bald eagles), followed by shooting (199), electrocution (154), trapping (49), and collision with lines, vehicles, wind turbines and wires (32). The cause of mortality for the remaining 786 bald eagles was identified as disease, disease-infection, drowned, emaciation, killed by another animal, killed by other eagle, not available/other, trauma, or unknown. Of the 1,553 bald eagle mortalities in the database, nine (0.58%) were due to collision with wind turbines.

The USFWS prepared a Final Programmatic EIS to evaluate proposed changes to the eagle permit rule and how they are managing eagles. In the analysis for the rule revisions, USFWS has estimated mortality numbers of golden eagles from a meta-analysis of marked birds. The analysis estimates annual anthropogenic mortality for golden eagles as follows: approximately 1,000 die from poisoning (with lead and rodenticides being leading cause of poisoning), approximately 1,000 die from shooting, approximately 600 from collisions (all sources of collision), and 550 from electrocutions. According to the USFWS, approximately 10% of the golden eagle population dies annually due to anthropogenic sources. The USFWS acknowledges that this same type of data is not available for bald eagles, so equivalent estimates of annual bald eagle mortality due to anthropogenic causes are not available. However, in the assessment of the revised permit rule, the USFWS suggests that mortality levels due to anthropogenic causes may be similar for bald eagles. Assuming 10% of the bald eagle population (27,617 bald eagles; USFWS 2009b, 2013a) in the Great Lakes EMU suffers mortality due to anthropogenic causes annually, approximately 2,762 bald eagle mortalities occur annually due to anthropogenic causes in the Great Lakes EMU. The annual post-2009 FEA baseline take request of up to 10 bald eagles due to collision with wind turbines in the Permit Area is approximately 0.4% of the estimated anthropogenic bald eagle mortality in the Great Lakes EMU.

The USFWS' approach to managing bald eagles and setting take thresholds has been developed to ensure that take levels do not exceed levels at which population level impacts will be realized. In the 2013 ECPG, take thresholds are further allocated to the local area scale for evaluations of cumulative effects. As described in Section 3.6.3.3, the local area scale was historically defined as the area within 69 km of a facility footprint. The local area scale for the Projects (a 69-km buffer around all facilities) corresponds to 111,626 km^2 (43,099 mi^2), of which 100,738 km^2 (38,895 mi^2) are within Iowa. Using the 2009 FEA eagle density estimate of 0.062 eagles per square mile in the Great Lakes EMU, the estimated population size would have been 2,672 bald eagles within the Projects' 69-km buffer.

The USFWS revised eagle rule considers impacts to eagles at two different scales: the EMU and LAP. The USFWS redefined EMUs, so that Iowa now belongs to the Mississippi Flyway, which has a population of 31,706 eagles (USFWS 2016b). The impact of taking 10 bald eagles per year represents 0.03% of the EMU population, which is well below the sustainable threshold of 5% set by the Service (USFWS 2016b). The 10 annual bald eagle fatalities are anticipated to be spread across the 2,021 existing turbines at the 22 covered Projects.

At the local area scale, the USFWS has set take thresholds of 1% and 5% of the estimated total eagle population size as significant, with 5% being at the upper end of what might be appropriate under the BGEPA preservation standard. To determine the LAP for MidAmerican, a 138-km buffer was placed around the 22 covered Projects (USFWS 2016c), which results in a total area of approximately 219,823 km^2 (84,874 mi^2). The density of bald eagles within the Mississippi River Flyway is estimated at 0.017 eagles per km^2, resulting in a bald eagle population estimate of 3,819 bald eagles. The impact of taking 10 bald eagles per year represents 0.26% of the LAP, which is well below the sustainable take threshold of 5% set by the Service (USFWS 2016c).

The LAP estimate is 3,819 eagles (USFWS 2016c). The 1% threshold is 38 eagles annually and the 5% threshold is 191 eagles annually. The Projects' anticipated and proposed take of 10 eagles per year is 0.26% of the LAP, which is well below the 1% threshold of the LAP. Additionally, as has been discussed above, the majority of the estimated take of eagles from the Projects are anticipated to be migrants or overwintering individuals, so the number of resident eagles taken would be an even smaller percentage of the LAP.

4.3.3.2 Conclusion

The predicted level of bald eagle take within the Permit Area is not anticipated to exceed levels established in the 2009 FEA for the Eagle Take Permit Rule, or within the revised Eagle Take Permit Rule (USFWS 2016b), which were set to ensure that the bald eagle population remained stable or increasing. Since bald eagle populations continue to increase, the assessment presented above is conservative in that the estimates for the bald eagle population and annual production are likely underestimates of the current numbers of bald eagles and annual production in the Plan Area. Given the USFWS approach to managing cumulative impacts by ensuring that annual take levels do not exceed 5% of the LAP, cumulative impacts are expected to remain within levels that would be sustainable for bald eagle populations in the Plan Area. In addition, at the EMU scale, the level of eagle take proposed under the HCP will be within the sustainable annual take limit for bald eagles in the coterminous United States and will not exceed the Great Lakes EMU take threshold.

4.4 Summary of Take

For the Covered Bat Species the Implementation Take is the expected take, which is the point estimate or mean estimate from the IEoA approach after accounting for the expected reduction due to the minimization measures (Table 4.2). The Authorized Take is the upper bound of the 90% confidence limit on the point estimate after accounting for the expected reduction due to the minimization measures. The permit limit take is the annual authorized take multiplied by 30 years.

Table 4.2. Summary of Annual and Term Covered Species Take Estimates.

Species	Indiana Bat	Northern Long-Eared Bat	Little Brown Bat	Tri-Colored Bat	Bald Eagle
Annual Implementation Take Estimate	10	9	640	387	NA
Implementation Take Over 30-Year Permit	300	270	19,200	11,610	NA
Annual Authorized Take Estimate	25	21	736	459	10
Authorized Take Over 30-Year Permit Limit	750	637	22,099	13,774	300

5.0 CONSERVATION PROGRAM

As described in the HCP Handbook (USFWS and NMFS 2016) and USFWS regulations, conservation or mitigation actions within an HCP usually take one or more of the following forms: (1) avoiding the impact (to the extent practicable), (2) minimizing the impact, (3) rectifying the impact, (4) reducing or eliminating the impact over time, or (5) compensating for the impact. Project effects can be avoided or minimized through timing restrictions and buffer zones; rectified by restoration and revegetation of disturbed Project areas; reduced or eliminated over time by proper management, monitoring, and adaptive management; and compensated by habitat restoration or protection at an on-site or off-site location(s). In practice, conservation plans often use several of these strategies simultaneously or consecutively. Ultimately, the level of mitigation provided in an HCP must be reasonably capable of being undertaken, and both commensurate with and rationally related to the impact of take under the plan.[14]

MidAmerican's conservation plan focuses on avoiding and minimizing potential impacts to Covered Species on Covered Lands and on compensating for the impacts of the taking of Covered Species through implementation of habitat restoration or protection measures in the State, which contains the populations determined by MidAmerican to be most likely impacted by the Covered Activities. Monitoring will be used to verify the effectiveness of these measures in meeting the biological goals and objectives of this HCP, provide information necessary to assess ITP compliance, and determine if adaptive management actions may be necessary to maintain Permit compliance.

5.1 Biological Goals and Objectives

Biological goals and objectives are an inherent part of the HCP process and define the expected outcome of the conservation plan (HCP Handbook [USFWS and NMFS 2016]). The goals are broad, representing the guiding principles for operation of the conservation program described in the HCP and forming the basis for the minimization and mitigation strategies employed. The biological objectives represent the steps through which the biological goals will be achieved, and

[14] See *National Wildlife Federation v. Norton*, 306 F.Supp.2d 920 (E.D. CA, February 4, 2004).

provide a basis for measuring progress towards achieving the goals. The biological goals and objectives of this conservation plan are to:

1. Contribute to the long-term persistence of the Covered Species by developing mitigation projects that will support the survival and recovery of the Covered Species in Iowa.
   a. The objective to achieve this goal is to provide funding to the Mitigation Entity to acquire, protect, and restore habitat in large blocks that provide extant or potential habitat for the Covered Species.

2. Contribute to maintaining the integrity of the populations of the Covered Species in Iowa by minimizing mortality of the Covered Species in the Permit Area.
   a. For bats, the objective to achieve this goal is to implement a turbine operational strategy that will decrease all bat mortality by approximately 35% from unfeathered levels for the Projects, thereby decreasing actual mortality of all bats, and specifically INBA, NLEB, LBBA, and TRBA, to no more than the permitted levels over the 30-year term of the ITP.
   b. For eagles, the objective to achieve this goal is to replace guyed met towers with free standing towers or install bird flight diverters on the guy wires.

3. Increase our scientific understanding of the risk of wind power development to the Covered Species in Iowa.
   a. The objectives to achieve this goal are to:
      i. conduct additional research related to the distribution of bat carcasses around turbines to improve mortality monitoring efforts for the Projects;
      ii. monitor bat mortality at the Projects to assess the level of incidental take of the Covered Bat Species and better understand bat-turbine interactions on the landscape at a fleet-wide scale;
      iii. monitor the Projects to estimate eagle mortality rates for comparison with model-based predictions; and
      iv. support research on bat migration biology and/or risks that are related to wind project siting.

5.2 Habitat Conservation Plan Development Activities

5.2.1 Conservation Research Efforts

MidAmerican Energy has implemented or supported research efforts that aided the development of this habitat conservation plan. Given the size and scope of the Project, MidAmerican and the Service identified several opportunities that could: (1) identify NLEB migratory behaviors in Iowa, (2) help the wind industry focus bat search efforts in areas where fatalities are most likely to be found, (3) improve the knowledge of eagle migration in the Upper Midwest, and (4) ensure MidAmerican’s O&M personnel receive appropriate training on the visual-scan wildlife searches required at each turbine visit.

5.2.2 Section 6 Habitat Conservation Planning Grant

MidAmerican is providing the non-federal matching portion of an ESA Section 6 planning grant in cooperation with the Service and the IDNR. The Section 6 planning grant created a federal nexus under the ESA, requiring Section 7 consultation for the action. As a result, the Service issued a BO and Incidental Take Statement in August 2015, covering areas of the state that are north of Interstate 80 and west of Interstate 35 (2015 BO Covered Area, McPeek 2105). The grant supports activities to help understand the range and migration patterns of NLEB in Iowa. In spring 2016, acoustic bat monitors were placed in areas with exposed or shallow bedrock near recorded NLEB observations to try to determine the location of potential hibernacula. The second phase used a statewide desktop analysis to evaluate potential suitable habitat on or near public lands. Based on the results of the desktop habitat analysis, acoustic detectors were placed throughout the 2015 BO Covered Area using the 2016 summer survey presence absence protocol to try to determine the species' range. Mist netting and a pilot long-term migration telemetry survey were conducted in fall 2016. Results from these activities will help inform population estimates and movement within the state of Iowa.

The State contracted with Iowa State University to deploy acoustic monitoring equipment at NLEB-suitable habitat on forested public lands at 120 sites spread throughout 60 Iowa counties. These surveys followed the USFWS *2016 Indiana Bat Summer Survey Guidelines* (USFWS 2016i). Acoustic detectors were deployed at each site to collect the equivalent of four detector nights in June and July 2016. The echolocation data were analyzed to identify bat species recorded during surveys using automated bat call identification programs BCID East v2.7d and EchoClass v3.1. Researchers then identified and calculated the total number of call files that were indicated by both programs to contain either a NLEB or LBBA call; the percentage of total bat calls identified as NLEB and LBBA; the number of call files that both programs agreed contained NLEB and LBBA calls; and the hourly distribution of total and *Myotis* bat calls across all sites. Acoustic detectors were also deployed at a number of potential hibernacula sites in March and April 2016, and from September through November 2016. These detectors were deployed facing a cave or bluff face that showed potential for suitable winter habitat for hibernating bat species. Acoustic survey data was then analyzed by the USFWS and Iowa State University using BCID East v2.7d and EchoClass v3.1.

For the NLEB, the BCID identified only 18 sites without a bat call, while EchoClass identified eight sites without a call. Looking at where both programs agreed on the presence of NLEB calls, 36 sites did not have NLEB calls. Nearly 50% of the sites where both programs agreed that NLEB calls were identified occurred in north central Iowa. For the LBBA, BCID identified 28 sites without an identified call and EchoClass 82 sites without a LBBA call. Both programs agreed on 26 sites without an identified LBBA call. Sites with a high number of either NLEB or LBBA calls did not appear to correspond to a high number of the other species. When the results were analyzed for hourly distribution, *Myotis* species calls peaked at midnight, whereas all-bat calls generally peaked at 9 p.m. Of the 122,908 files identified by the software as containing bat calls, a total of 234 (0.19%) files were recorded before sunset and a total of two files were recorded after sunrise. Of these call files, only four were identified by BCID as containing LBBA calls, with the calls occurring six (one call) and three (three calls) minutes before sunset. No LBBA calls were identified after sunrise. No files were identified as containing NLEB calls before sunset or after sunrise. Potential hibernacula monitoring recorded probable *Myotis* calls as early as March 16 at one site and as late as November 27 at one site. *Myotis* calls were recorded at all potential hibernacula locations, but the number of probable *Myotis* calls varied among the surveyed sites. Many of these potential hibernacula will be targeted for canine detection surveys and thermal and near-infrared video monitoring surveys during the spring emergence period as part of Phase II grant work in early 2017 (Blanchong 2017).

The State separately contracted with WEST[15] to conduct a NLEB fall migration expanded pilot study in eight counties in Iowa (Palo Alto, Pocahontas, Humboldt, Webster, Boone, Madison, and Mahaska counties). Long-term coded radio telemetry tags were attached to 28 NLEB and five LBBA that were captured between August 10 and September 13, 2016, near the West Fork of the Des Moines River northeast of Humboldt, Iowa. An array of 31 radio telemetry antennas and data logging receivers collected telemetry data from August 18, 2016, to November 16, 2016, resulting in 764,305 data points used to evaluate movement of the telemetered bats. Transmitter failure and shedding from the telemetered bats resulted in eight bats retaining radio tags until migratory or long distance movements were detected, which occurred between late August and mid-September. These eight bats were observed staying in the core habitat use area until undertaking long-distance movements (more than one mile/night), indicating likely migratory behavior along the Des Moines River corridor. Three of the telemetered bats exhibited unidirectional movement south along the Des Moines River corridor, which appears to indicate migratory behavior rather than long-distance foraging behavior (WEST 2017).

5.2.3 Particle Distribution Model

MidAmerican has partnered with the University of Iowa IIHR-Hydroscience and Engineering group (IIHR) to develop a numerical model to simulate the interaction of bats with a utility-scale wind turbine (Appendix E). The intent of the model development is to understand the distribution of where bats struck by a wind turbine blade may fall to the ground. The model incorporates operational SCADA data collected at the turbine level along with carcasses discovered during the 2016 post-construction monitoring surveys. IIHR combined computational fluid dynamics code and lagrangian particle dynamics code to predict bat carcass trajectories based on a range of wind speed, turbine operation and bat physiological parameters. Results indicate that in all simulation cases that were studied, 90% of modeled bats fall within 100 m (328 ft) of the turbine tower. Heavier carcasses are concentrated closer to the turbine compared to lighter carcasses; modeled bats that hit the lower half of the rotor fell closer to the tower than those hit on the upper half; and rotational speed of the turbine blades upon impact with a modeled bat was shown to have a more significant effect on carcass distribution. Much of the variability in the simulations could be reduced with more information related to bats' behavior when approaching and use of the rotor-swept zone. The model's particle distribution outputs could be used to potentially inform post-construction carcass survey design, refine area correction factors, or evaluate minimization measure development. The results may also help inform the design and layout of future wind energy facilities to facilitate efficient search efforts. For example, the report recommended placement of strips of high visibility material arranged in four to eight rays emanating from the turbine pad to help determine angular distribution around a turbine, which could result in higher

[15] This work was independently bid by the State and awarded to WEST's Bloomington, Indiana, team. Subsequent to the contract award, the Bloomington team has been screened from work on MidAmerican's HCP.

searcher efficiency (due to increased visibility of carcasses) and reduced time spent searching as compared to a cleared square plot (Appendix E).

Development and testing of the model required collection of post-construction monitoring data from large cleared plots, so MidAmerican acquired temporary voluntary easements from landowners for the establishment and maintenance of 263 cleared search plots at the 12 facilities where post-construction monitoring took place in 2016. There were three plot size classes, 60 x 60 m (197 x 197 ft), 100 x 100 m, and 200 x 200 m (656 x 656 ft), totaling approximately 277 ha (684 acres). The plots are maintained at a vegetation height of 10 to 15 cm (four to six inches). Discoveries within the cleared plots were correlated with wind and operating conditions based on the search interval and the estimated relevant time period, helping to refine the particle distribution model.

5.2.4 Bald Eagle Research

MidAmerican provided funding to support a cooperative research program with the Service, West Virginia University and The Peregrine Fund. The research program is designed to understand the ecology of bald eagle movement in the upper Midwest to aid management of a recovering population. MidAmerican's funding match supported efforts to buy and place cellular and Geographic Information System telemetry units on bald eagles captured and released near the Mississippi River in the Iowa and Illinois-Quad Cities area. Individual bald eagle movement is recorded at intervals ranging from 30 seconds to 15 minutes and transmitted via cell modem. The research will help inform eagle movements and impact patterns.

5.2.5 Wildlife Incident Reporting System

MidAmerican has developed and published an avian identification guide with illustrations of common avian species (see Appendix F), as well as reporting protocols, and distributed the guide to O&M staff for use as a common reference when wildlife discoveries are reported. O&M staff receive training in wildlife discovery and reporting as part of the contractor onboarding training protocol. O&M staff also receive annual refresher training. In June 2015, Kraig McPeek with the USFWS Illinois-Iowa Field Office attended the regular wind O&M supervisor call to underscore the importance of wildlife reporting as part of MidAmerican's wildlife conservation efforts.

5.3 Avoidance, Minimization and Mitigation Measures

5.3.1 Avoidance through Project Design and Planning

Agriculture is the leading land use in Iowa. Native bird and bat habitat is typically limited to small, fragmented grasslands and fallow fields, small groves of trees and fencerows near homesteads, and the riparian corridors of streams with fringe wetlands. MidAmerican's Projects are located in areas dominated by agriculture, which avoids the removal of forest vegetation that is typically used by the Covered Species and minimizes environmental impacts to sensitive species and habitats (see Section 3.1). MidAmerican also implemented the following practices during Project construction and continues to implement these avoidance and minimization measures to avoid potential impacts to birds and bats. Similar measures will be implemented during construction activities associated with repowering and the Wind XI projects.

O&M and Substation Lighting – MidAmerican has kept lighting at turbines, O&M buildings and Project substations to a minimum to safely and securely operate its facilities, consistent with facility security requirements. O&M personnel are directed to extinguish nighttime exterior lights at O&M buildings and substations (consistent with facility security requirements) when not in use and O&M personnel are briefed on the importance of minimizing nighttime light use. During routine maintenance activities to replace failed lighting fixtures and as lighting systems are updated or reconfigured, MidAmerican will replace failed exterior lights with hooded downward-directed lights to minimize horizontal and skyward illumination, and, whenever possible and consistent with physical security requirements, lights with motion or heat sensors and switches will be used to keep lights off when not required.

Wind Turbine Lighting – Aviation hazard lighting is minimized to that which is required by the FAA. The FAA typically requires every structure taller than 200 ft (61 m) above ground level to be lit to improve visibility to aviation traffic. In the case of wind power developments, the FAA allows a strategic lighting plan that provides complete visibility to aviators but does not require lighting every turbine. MidAmerican's lighting plan uses the minimal level of lighting acceptable to the FAA and employs medium-intensity red synchronously flashing lights for nighttime use and for daytime use, if needed, as recommended by the FAA and in the WEG.

Tubular Turbine Towers – Tubular towers, rather than lattice towers, were used to reduce the potential for birds to perch or nest near the blades of wind turbines.

Ongoing Erosion and Weed Control – MidAmerican implements steps to mitigate erosion and control noxious weeds at or immediately adjacent to its facilities, along roads built as part of the Projects, and at other areas disturbed during Project construction. All herbicide and pesticide mixing and applications are conducted in accordance with all federal, state, and local laws and regulations and the specific product's label. Herbicide and pesticide application are directly applied to a localized spot and will not be applied by broadcast techniques.

Met Tower Upgrades – Over the course of maintaining and updating existing met towers, MidAmerican strives to replace all guyed met towers with free-standing un-guyed met towers. MidAmerican removed all Company-owned guyed towers by the end of 2017.

Pole and Wire Replacement and Retrofits – MidAmerican implemented Avian Power Line Interaction Committee (APLIC) guidelines in *Suggested Practices for Avian Protection on Power Lines, the State of the Art in 2006* (APLIC 2006) and *Mitigating Bird Collisions with Power Lines: the State of the Art in 2012* (APLIC 2012). MidAmerican continues to implement these guidelines when it replaces and retrofits poles and wires at existing facilities.

5.3.2 Minimization Measures

MidAmerican has developed measures to minimize the impacts to Covered Species, including carrion removal programs and landowner education efforts to minimize the impacts of bald eagle take and operational adjustments to minimize impacts to Covered Bat Species.

Animal carcasses can attract scavenging eagles into the wind farm, increasing risk to eagles. For bald eagles and other avian species, MidAmerican has worked with O&M personnel to develop procedures to remove wildlife and livestock carcasses when encountered. Wildlife and livestock carcasses near access roads and turbines are reported to the appropriate wind project supervisor and recorded in MidAmerican's wildlife incident reporting system form. MidAmerican has also developed fact sheets distributed in newsletters to wind project landowners, explaining the importance of MidAmerican's carrion removal program.

MidAmerican's measures to minimize the impacts to Covered Bat Species were developed from the studies conducted at the covered Projects over a two-year period, and, based on existing information, are estimated to reduce take by approximately 35%. The results of these studies enabled MidAmerican to focus its operational strategies on Projects where impacts to Covered Bat Species are most likely to occur. MidAmerican will feather all turbines at all Projects below manufacturer's cut-in speeds at night from March 15 through November 15 each year. MidAmerican will also feather turbines at Charles City, Lundgren, Macksburg and Wellsburg below raised nighttime cut-in speeds of 5.0 m/s from July 15 through September 30 each year. The only exception to feathering turbines below a cut-in speed of 5.0 m/s would occur on nights when temperatures are below 10 °C (50 °F).[16] Turbines will be feathered below the manufacturer's cut-in wind speed below these temperatures. Turbines will be monitored and controlled based on temperature on an individual basis (i.e., the entire facility will not alter cut-in speed at the same time, rather operational changes will be based on temperature conditions specific to each turbine). Turbines will begin operating under normal conditions (i.e., feathering below manufacturer's cut-in speed) when the 10-minute rolling average temperature drops below 10 °C; raised cut-in speeds will be resumed if the 10-minute rolling average temperature goes to 10 °C or above during the course of the night.

Blade feathering consists of turning turbine blades parallel to the prevailing wind direction to reduce rotation of the turbine rotors to less than two revolutions per minute at pre-defined wind speeds. Manufacturer's cut-in speed for most of the Projects is 4.0 m per second (m/s; 13 ft/s; 1,452 total turbines) except for Eclipse, Morning Light, Vienna I and II, Highland, Lundgren, and Macksburg, which use 3.0-4.0 m/s (9.8-13.1 ft/s; 567 total turbines); and the State Fair Turbine at 4.9 m/s (16.0 ft/s; one turbine). Projects which may be repowered, including selected turbines located at Carroll, Century, Charles City, Intrepid, Pomeroy, Victory, and Walnut, will reduce the

[16] The 10 °C temperature threshold is based on results from post-construction mortality monitoring at the Fowler Ridge Wind Farm, Benton County, Indiana, and nightly temperatures measured at 10-minute increments derived from turbine SCADA data between the hours of 20:00 and 08:00 from August 1 to October 15, 2010-2012. These data show that the proportion of fresh bat fatalities that occurred when average nightly temperatures were above 10 °C was 99.7% (285 fatalities out of 286; range in nightly temperatures in this group of fatalities was 42.8 °F to 88.9 °F [6.0 °C to 31.6 °C]) in 2010, 99.0% (307 fatalities out of 310; range in nightly temperatures in this group of fatalities was 44.4 °F to 85.6 °F [6.9 °C to 29.8 °C]) in 2011, and 98.2% (55 fatalities out of 56; range in nightly temperatures in this group of fatalities was 44.1 °F to 100.4 °F [6.7 ˚C to 38.0 °C]) in 2012. Average nightly temperatures that were below 10 ˚C occurred about 4.1%, 2.7%, and 9.5% of the time in 2010, 2011, and 2012, respectively.

manufacturer cut-in speed from 4.0 m/s to 3.5 m/s (11.5 ft/s) and from 3.5 m/s to 3.0 m/s (see Table 2.3 for specific repower turbine numbers and specifications). Research suggests that feathering below the manufacturer's cut-in speed can reduce fatalities by approximately 35% to 57.5% (Baerwald et al. 2009, Young et al. 2011, Good et al. 2012). Given the range of manufacturer cut-in speeds across the Projects, MidAmerican conservatively estimated that feathering blades below the normal turbine cut-in speed will reduce bat fatalities by approximately 35%. For the term of the ITP, MidAmerican Energy will adjust the turbine operational parameters so that the turbine blades are feathered when wind speeds are below the normal turbine cut-in wind speed. This adjustment will be implemented on a nightly basis from sunset to sunrise from March 15 to November 15 each year. Based on surveys completed to date, this period corresponds with the annual period when impacts to the Covered Bat Species are likely to be the highest (Figures 5.1 and 5.2). Acoustic surveys completed as part of the Section 6 Habitat Conservation Planning Grant support limiting blade feathering on a nightly basis from sunset to sunrise (see Section 5.2.2 for acoustic survey results related to bat calls identified before sunset or after sunrise). The only exception to feathering turbines below the manufacturer's cut-in speed would occur on nights when temperatures are below 4.4 °C (40 °F)), in order to minimize icing on the turbine blades

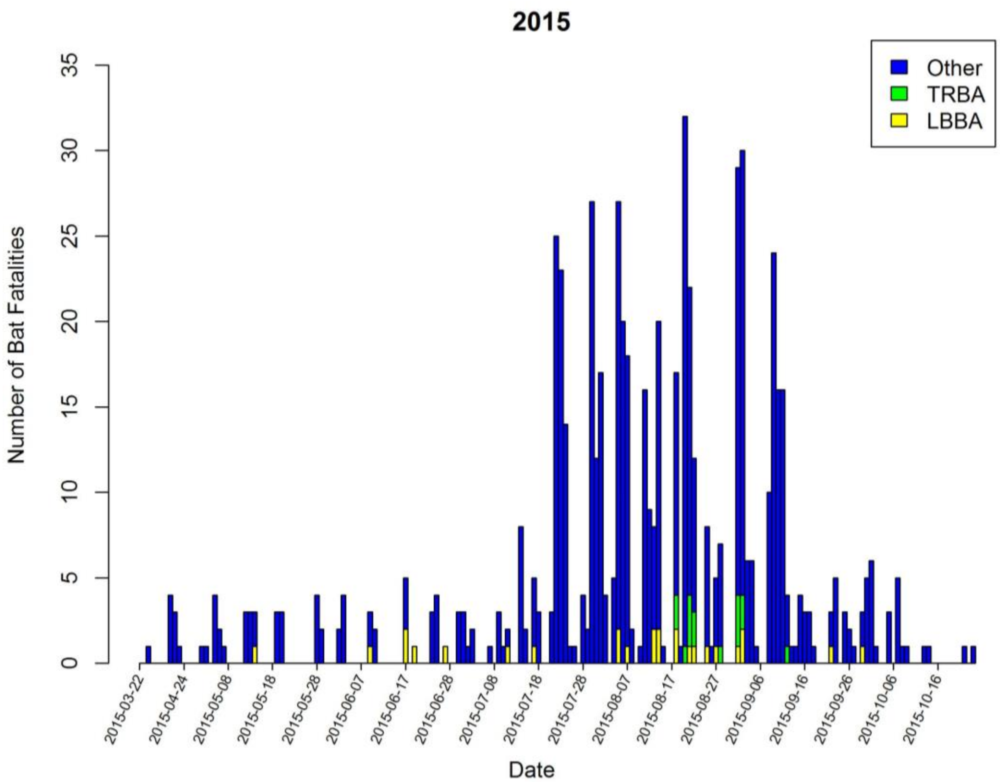


Figure 5.1. Bat Fatalities Observed by Date during Monitoring in 2015. (TRBA = tri-colored bat; LBBA = little brown bat.)

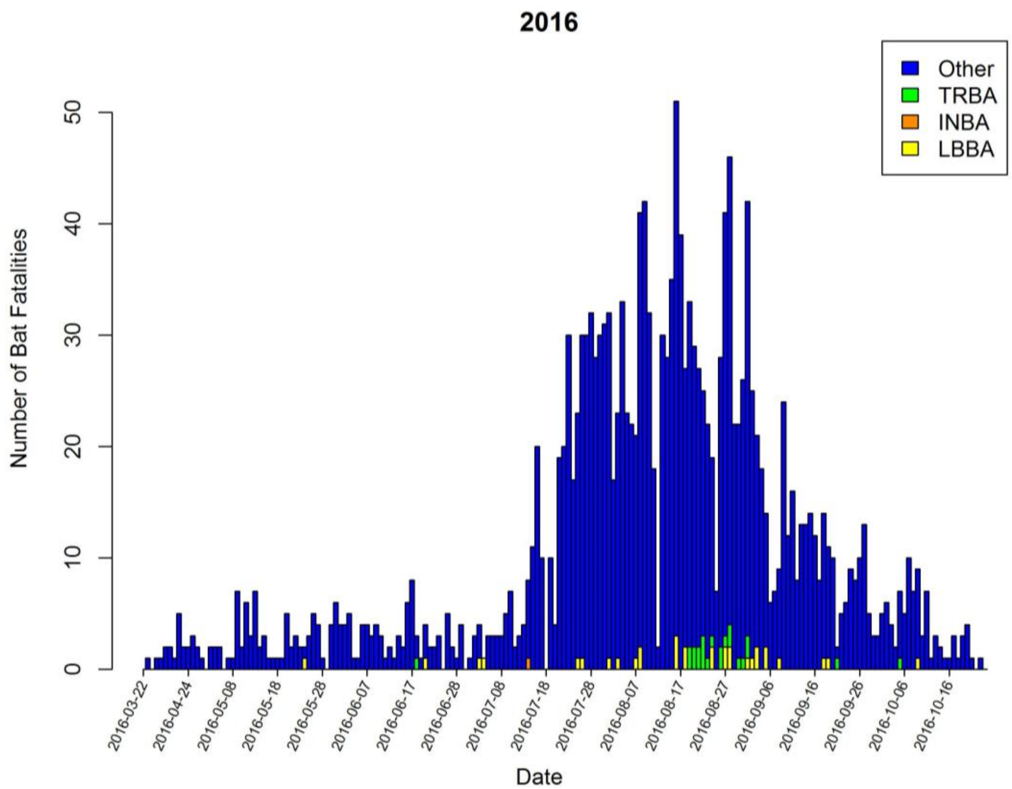


Figure 5.2. Bat Fatalities Observed by Date during Monitoring in 2016. (TRBA = tri-colored bat; INBA = Indiana bat; LBBA = little brown bat.)

Turbines at each Project will be monitored and controlled based on wind speed on an individual basis or by small groups of turbines (i.e., the entire facility will not alter cut-in speed at the same time). Turbines will be released to run normally when the 10-minute rolling average wind speed, as monitored at individual turbines, is above the normal cut-in wind speed. Turbine blades will be feathered when the 10-minute rolling average wind speed drops below the normal cut-in wind speed during the course of the night.

MidAmerican evaluated mortality monitoring data, specifically Covered Bat Species fatality counts and all-bat fatality rates using a weight-of-evidence approach to identify Projects at which to increase nighttime cut-in speeds during the bat active season would have the greatest benefit to the Covered Bat Species. MidAmerican gave the most weight to Covered Bat Species fatality counts, and within that dataset, Projects with *Myotis* fatalities were prioritized over those with *Perimyotis* fatalities.[17] MidAmerican also first evaluated Covered Bat Species mortality counts and then looked at all-bat fatality rates to meet biological goal (2) objective (a). From this analysis, MidAmerican determined that the Charles City, Lundgren, Macksburg and Wellsburg projects present a relatively higher risk to Covered Bat Species and will increase nighttime cut-in speeds at these Projects from July 15 to September 30 each bat active season.

Macksburg was the only Project at which a listed bat carcass (INBA) was discovered.[18] Macksburg had 25 *Myotis* and *Perimyotis* fatalities, Lundgren had 39, Charles City had 13 and Wellsburg had

[17] *See* Table 1 of the executive summary to the 2014-2017 PCM Report in the Technical Addendum.
[18] This carcass is covered by the incidental take statement in USFWS' August 2015 BO.

8 (only one of which was *Perimyotis*). All-bat fatality rates, after feathering, are expected to be 54.45 per turbine at Macksburg, 24.62 per turbine at Lundgren, 18.76 per turbine at Wellsburg, and 10.15 per turbine at Charles City, assuming a 35% reduction from blade feathering (Table 5.1). Each of these four Projects also had suitable habitat for the Covered Bat Species within or in close proximity to the Project and Covered Bat Species calls were confirmed for Macksburg and Lundgren during acoustic surveys at the Projects (WEST 2016). While an INBA call was confirmed at Laurel during acoustic surveys and eight Covered Bat Species were each found at Highland and Rolling Hills, only one Covered Bat Species (LBBA) was discovered at Laurel and only one *Myotis* fatality each was found at Highland and Rolling Hills.

Table 5.1. Summary of 2015 and 2016 Bat Fatality Monitoring Data (Summed and Averaged).

Facility	Estimated Average Fatalities Per Turbine	Estimated Average Fatalities Per Turbine with Feathering [a]	Total Covered *Myotis* & *Perimyotis* Fatalities
Adair	28.03	18.22	0
Adams	24.83	16.14	4
Carroll	15.06	9.79	0
Century	13.61	8.84	3
Charles City	15.62	10.15	13
Eclipse	19.92	12.95	1
Highland	20.24	13.16	8
Intrepid	27.55	17.91	0
Laurel	32.71	21.26	1
Lundgren	37.88	24.62	39
Macksburg	83.76	54.45	25
Morning Light	39.65	25.77	1
Pomeroy	9.38	6.09	1
Rolling Hills	13.18	8.57	8
Victory	8.49	5.52	0
Vienna I	21.32	13.86	4
Vienna II	24.11	15.67	3
Walnut	28.03	18.22	0
Wellsburg	28.87	18.76	8

[a] Estimated 35% reduction.

MidAmerican also evaluated the timing of Covered Bat Species discoveries at Charles City, Lundgren, Macksburg and Wellsburg to refine the period of risk. The single INBA carcass was discovered at Macksburg on July 13, 2016; the majority of Covered Bat Species carcasses were discovered between July 1 and September 15 (Table 5.2). Available monitoring data indicate this period captures the period of highest Covered Bat Species risk at these Projects, and that the period of highest all-bat fatalities was approximately July 15 through October 15. The results of the Section 6 grant migration studies indicate that NLEB migration is likely occurring through the end of September.

Table 5.2. Timing of Covered Bat Species Discoveries at Charles City, Lundgren, Macksburg, and Wellsburg.

Facility	85% Start and End Dates		75% Start and End Dates	
	2015			
Lundgren	6/8/2015	9/1/2015	6/18/2015	8/31/2015
Macksburg	7/10/2015	9/21/2015	7/10/2015	9/21/2015
	2016			
Charles City	5/23/2016	10/8/2016	8/7/2016	9/18/2016
Lundgren	6/17/2016	9/1/2016	6/17/2016	9/1/2016
Macksburg	7/13/2016[a]	8/29/2016	8/2/2016	8/26/2016
Wellsburg	7/31/2016	9/18/2016	7/31/2016	9/17/2016

[a] Date of the Indiana bat find.

To capture the period of highest risk for Covered Bat Species and to reduce fatality rates of all bat species, MidAmerican will increase the cut-in speed to 5.0 m/s (16.4 ft/s) at these four Projects from July 15 through September 30.

5.3.3 Measures to Mitigate the Impact of the Taking

The Covered Activities identified in this HCP, including mitigation actions, cover a broad geographic scale. MidAmerican has partnered with the Iowa Natural Heritage Foundation (INHF) to serve as the Mitigation Entity and implement mitigation actions under this HCP. MidAmerican will work with INHF, with input from USFWS and IDNR, to implement mitigation projects consistent with the criteria described below. Projects will be presented to a Technical Review Team for evaluation and recommendation to USFWS (see 5.3.3.3.3).

5.3.3.1 Covered Bat Species

The turbine operational protocols are expected to reduce take of the Covered Bat Species at the Projects; however, some level of incidental take is still expected to occur over the term of the Permit. To meet the mitigation requirements for the impacts of this take, MidAmerican will provide funding to an appropriate Mitigation Entity to implement habitat protection and/or restoration projects that are expected to reduce threats to the Covered Bat Species and are expected to result in an increase in the populations of the Covered Bat Species in Iowa (before accounting for the impacts from WNS).

MidAmerican Energy used REA models developed by USFWS (USFWS 2016e, 2016f, 2016g) to determine the appropriate amount of mitigation to fully offset the impacts of the taking for the Covered Bat Species (see Appendix G). MidAmerican will fund mitigation associated with Implementation Take; adaptive management triggers have been identified to address impacts and fund mitigation up to Authorized Take (see Section 5.5).

Based upon the impacts of the taking analyses (see Section 4.2.3, Section 4.2.5, and Section 4.2.7), use of the REA models provides a conservative estimate of mitigation needs due to the assumptions made regarding the number of females of each species potentially taken. For INBA and NLEB, the two ESA-listed species (Section 4.2.3 and Section 4.2.5), the estimated impact for INBAs is greater than the estimate for NLEB (Appendix G). As discussed in Chapter 4, the overall population size for LBBAs is approximately 6.5 million bats, and for TRBAs approximately 451,000 bats. The take of LBBAs and TRBAs requested by MidAmerican Energy equates to less than 0.5% of the estimated range-wide populations of both species. Accordingly, the impacts of the take are low and would be fully offset by the mitigation calculated for INBAs and NLEBs through the stacking principal and by providing additional mitigation specific to LBBAs, such as use of artificial structures or protecting swarming and/or wintering habitat.

MidAmerican analyzed whether Covered Bat Species are likely to overlap on and make use of mitigation habitats (see Appendix H). Available biological information indicates that these species co-occur in the same habitats and while competition among them for resources may occur, niche partitioning allows them to co-exist and utilize the same habitats. MidAmerican also worked with the USFWS Illinois-Iowa Field Office to analyze existing acoustic survey and mist-net bycatch data to establish a mitigation stacking multiplier (A. Schorg, USFWS, pers. comm. 2017). Given the uncertainty in habitat and food resource competition, a 10% acreage multiplier per Covered Bat Species is proposed for mitigation where a parcel will be used as mitigation for more than one species. For example, for a mitigation project where the suitable habitat acreage would be applied to a single Covered Bat Species, the habitat stacking multiplier would be 1.0, but if the mitigation acreage would be applied to two or more Covered Bat Species, the multiplier would be a 10% discount for each successive species.

MidAmerican's Implementation Take mitigation program is based on a combination of habitat protection, restoration and/or improvements and preservation of artificial structures. The habitat component consists of the acreage calculations from the INBA and NLEB REA models and a stacking multiplier of 10% each for LBBAs and TRBAs (Table 5.3).

Table 5.3. Implementation Take – Mitigation Stacking Results.

Covered Bat Species	Mitigation Acreage	LBBA Stacking Multiplier	TRBA Stacking Multiplier
INBA acres	742	1.1x742 = 816	1.2x742 = 890
NLEB acres	349	1.1x349 = 384	1.2x349 = 419
Totals	**1,091**	**1,200**	**1,309**

These mitigation totals correspond to Implementation Take after minimization for the Covered Bat Species and will fully offset the impacts of the take for INBAs and NLEBs without any need for discounting. These projects will also provide benefits to LBBAs and TRBAs, which will be accounted for with mitigation stacking for a total of 1,309 acres; 890 acres in the INBA range and 419 anywhere in Iowa). While there is not a REA model for TRBAs available, this species co-occurs with the other Covered Species (see Appendix H). The cumulative effect of all the mitigation for INBAs, NLEBs, and LBBAs will fully offset the impacts of the take of TRBAs.

Based upon communications with INHF (J. McGovern, pers. comm. 2017), MidAmerican estimates that it can protect and enhance key maternity habitat within Iowa at a cost of approximately $3,000 per acre. MidAmerican calculated a mitigation need for Implementation Take of approximately 742 acres of INBA habitat and 349 acres of NLEB habitat, according to the INBA and NLEB REA models (Appendix G), plus an additional 218 acres of stacked mitigation for LBBAs and TRBAs. At $3,000 per acre, bat mitigation would total approximately $3.927 million. MidAmerican also calculated a mitigation need for Authorized Take of approximately 3,200 acres, which, at $3,000 per acre, equates to approximately $10.1 million. The difference between Implementation Take mitigation and Authorized Take mitigation will be managed as part of MidAmerican's adaptive management protocol (see Section 5.5).

In addition to habitat acres, the REA models developed by USFWS contemplate that artificial structures (e.g., barns, abandoned structures, outbuildings, schools, churches, etc.) that are currently functioning as bat habitat may be protected or stabilized to further provide mitigation benefits. Such structures may contain substantial numbers of Covered Bat Species. For example, a single barn could contain over 1,000 bats, an amount considered to be a "small" colony size (Kunz and Reynolds 2003). These existing structures present an important mitigation opportunity in addition to enhancement of owned or permanently protected land. The cost to protect or stabilize an abandoned structure is difficult to estimate, and may vary depending on the type of structure involved. MidAmerican believes that the salvage value of an abandoned structure is a reasonable estimate of the cost to stabilize the structure. MidAmerican worked with the INHF to determine a salvage value for barns and other similar structures (J. McGovern, INHF, pers. comm.). Based on INHF's experience and other research, the salvage value is not likely to exceed $10,000 per structure.[19]

Through the stacking principle discussed above and using the USFWS Resource Equivalency Analysis models, the habitat mitigation for INBAs and NLEBs is expected to provide 2,772 LBBA credits. Subtracting 2,772 from the estimated LBBA impact of take of 43,854 results in 41,082 LBBA debits remaining. This take would be offset by 21,087 bats in maternity colonies (see Appendix G). Assuming that, on average, a suitable structure could host 500 individual LBBA, this take could be offset by preserving 42 structures at a total cost of approximately $420,000.

MidAmerican's Covered Bat Species mitigation program for Implementation Take equals approximately 1,309 acres of habitat and 42 artificial structures at a total cost of approximately $4.347 million.

For Authorized Take, MidAmerican also calculated a mitigation need (with a 35% reduction for minimization) for INBA of approximately 1,854 acres, for NLEB of approximately 813 acres, and for LBBA of 50 artificial structures (Table 5.4).

Table 5.4. Authorized Take – Mitigation Stacking Results.

Covered Bat Species	Mitigation Acreage	LBBA Stacking Multiplier	TRBA Stacking Multiplier
INBA acres	1,854	1.1x1,854 = 2,039	1.2x1,854 = 2,224
NLEB acres	813	1.1x813 = 894	1.2x 677.5= 976
Totals	**2,667**	**2,933**	**3,200**

Including stacking multipliers for the other covered bat species, this is a total of 3,200 acres and 50 artificial structures that would be needed to fully offset the Authorized Take. Following the same mitigation stacking process described above, which, at $3,000 per acre and $10,000 per artificial structure, equates to approximately $10.1 million. The difference between Implementation Take mitigation and Authorized Take mitigation will be managed as part of MidAmerican's adaptive management protocol (see Section 5.5).

5.3.3.2 Bald Eagle

Chapter 4 described the estimated level of mortality for bald eagles both with and without minimization measures in place. Minimization measures may reduce eagle mortality at the Projects; however, no quantitative estimates of reductions in eagle fatalities exist for the proposed measures. Therefore, the estimated level of mortality for bald eagles is expected to be less than or equivalent to the mortality without minimization measures in place, which is 10 bald eagles per year, or 300 bald eagles over the 30-year ITP term. As discussed in Section 4.3.3.1, this level of impact is less than 1% of the LAP and is fully consistent with the preservation standard, even if no minimization measure succeeds in reducing eagle mortality. Nevertheless, MidAmerican will provide compensatory mitigation for bald eagle take as part of this HCP to offset impacts to eagles.

MidAmerican used three techniques to calculate compensatory mitigation value on a per eagle basis and for total potential take of 300 eagles at 10 eagles per year (Appendix I). The per-eagle

[19] See, e.g., https://www.thebarnpages.com/OldBarnsForSale.cfm (last visited April 10, 2017).

mitigation value ranged from $30,600 for a power pole retrofit program, to $6,077 for a toxic substances abatement program, and $4,600 per eagle for an eagle rehabilitation program. The compensatory mitigation cost for total potential take of 300 eagles ranged from $9,180,000 for a power pole retrofit program, to $1,823,000 for a toxic substance abatement program, and $1,380,000 for a rehabilitation program. In view of these wide-ranging estimates, MidAmerican Energy proposes to develop an eagle conservation fund averaging the per-eagle cost estimates from the lead abatement model and an eagle rehabilitation program (($6,077+$4,600)/2 = $5,340/eagle[20]). The total proposed mitigation amount to fully compensate for the take of up to 300 bald eagles is $1,602,000.

5.3.3.3 Mitigation Implementation

MidAmerican Energy will establish two separate conservation funds, a Bat Conservation Fund and an Eagle Conservation Fund, that will be used to fund actions within the State that are designed to enhance the survival and recovery of Covered Species, including but not limited to habitat restoration and protection. The conservation funds will be funded as interest-bearing escrow accounts within 90 days of permit issuance. The Eagle Conservation Fund will total approximately $1.6 million, which is the full compensatory mitigation amount calculated for eagles and described in Section 5.3.2. The Bat Conservation Fund will be funded at approximately $4.377 million, which is the compensatory mitigation amount calculated for Implementation Take. MidAmerican will provide additional funding for the Bat Conservation Fund so long as this funding obligation remains in effect and in accordance with the Adaptive Management Plan (see Section 5.5).

The goal of MidAmerican's compensatory mitigation plan is to improve the viability of Covered Species in the State by improving habitat conditions and habitat availability, and thus Covered Species' survival. This goal may be achieved by protecting and/or actively managing key habitat to enhance habitat values for Covered Species. Collectively, these actions are intended to improve conditions relative to current conditions for these species.

Because the Projects are already operating, it will be a priority for MidAmerican and the INHF to identify and quickly deliver several mitigation projects in the first year of HCP implementation. MidAmerican used the REA models (see Appendix G) and the stacking methodology discussed above to calculate mitigation needs for the first three years of the permit term (Table 5.5). Mitigation totaling 279 acres and four barns will be delivered within the first year following permit issuance. Mitigation will occur at an annual rate of at least 147 acres and four barns per year thereafter, until the mitigation obligation is fulfilled.

Table 5.5. Initial Mitigation Requirements.

Covered Bat Species	Mitigation Acreage	LBBA Stacking Multiplier	TRBA Stacking Multiplier
INBA acres	162	1.1x162 = 178	1.2x162 = 194
NLEB acres	71	1.1x71 = 78	1.2x71 = 85
Totals	**233**	**256**	**279**

INHF anticipates that the balance of all mitigation projects funded in accordance with Section 5.3.3 will be fully delivered within 10 years following HCP approval. INHF's priority will be to permanently protect mitigation lands and structures by acquiring a combination of INHF-owned

[20] See also http://wildlifecenter.org/news_events/news/thoughts-ed-clark-putting-price-tag-eagle.

land, currently private land that is transferred to a public agency for management, and perpetual conservation easements. As mitigation projects are identified, the INHF will emphasize the quality of habitat and areas that are currently at risk from development or other pressures. However, the INHF will also evaluate and may recommend projects where habitat restoration or development is warranted.

5.3.3.3.1 Covered Bat Species

MidAmerican has worked with the USFWS Illinois-Iowa Field Office to develop a draft mitigation framework. The Technical Review Team, which is comprised of representatives from MidAmerican, USFWS, IDNR and the Mitigation Entity[21], will use the mitigation framework to screen, evaluate, and select potential mitigation projects that meet the initial mitigation criteria framework. Mitigation projects for the Covered Bat Species will be funded by the Bat Conservation Fund. Mitigation criteria include the following (see Table 5.6):

1. Enhancement, restoration and protection projects will occur within the state of Iowa.

2. Enhancement and protection projects will occur at sites that are known to be used by the Covered Bat Species (i.e., documented by following the applicable USFWS Summer Bat Survey Protocol) or are assumed to have a high likelihood of being used by Covered Bat Species based on proximity to known roosting and foraging sites. Sites will be selected from across the Iowa landscape using the following conditions:

    a. Mitigation areas of interest within Iowa will be identified at a watershed level, and will comprise 10-digit Hydrologic Unit Code (HUC) watershed boundaries that have records documenting presence of one or more Covered Bat Species within the previous 10 years; and
    b. Mitigation projects will be selected from within the areas of interest at the sub-watershed level and will occur within, or directly adjacent to, a 12-digit HUC watershed boundary occupied with one or more Covered Bat Species.[22] In addition, such parcels must be currently unprotected and face potential threats of habitat loss in order to qualify as mitigation under this HCP.

3. Enhancement projects will occur in areas where there is an ability and need to manage a sustainable supply of roost trees and habitats (e.g., creating snags in areas where snags are limiting and implementing silvicultural practices to ensure forest succession to high quality bat habitat).

4. Key priorities for action are to protect bat roosting or foraging habitat, to facilitate reforestation of corridors between known roosting habitat and foraging areas, and to facilitate reforestation

[21] The Technical Review Team is intended to be limited in size. However, MidAmerican and the Mitigation Entity are aware of the many stakeholders who may have potential mitigation projects available. The mitigation selection framework is flexible to allow consideration of projects identified by other parties, in addition to those identified by the Mitigation Entity.
[22] Empirical evidence suggests that the Covered Bat Species overlap on the landscape rather than compete. This overlap and species specialization for resources informs MidAmerican's mitigation stacking credit. See Appendix H for more details.

of woodlots and other blocks of habitat. Potential projects would also be evaluated on the basis of the following ecological context:

a. The proposed project would support repairing or enriching suitable habitat connectivity;
b. Proposed projects must be suitable habitat (for protection projects) or directly connected to suitable habitat (for restoration or enhancement projects); or
c. Suitable habitat for the covered species is limited within the 10- or 12-digit HUC watershed boundary of the proposed project.

5. The Technical Review Team may need to select among several potential mitigation projects or rank projects in order of priority. The following prioritization criteria will be applied to projects to identify the order in which projects may be completed:

Table 5.6. Mitigation Project Prioritization Criteria

Prioritization Criterion	Explanation
Proximity to other protected conservation land complexes	- Close proximity results in higher ranking - Higher number of conservation lands may result in higher ranking
Opportunity to fill in forested habitat conservation gaps	Positive opportunity results in higher raking
Opportunity to fill in protected-land gaps	Positive opportunity results in higher raking
Proximity to winter habitat	Close proximity results in higher ranking
Proximity to permanent water	Close proximity results in higher ranking
Parcel contains a barn or other artificial structure occupied by one or more Covered Bat Species	Occupied structure(s) results in a higher ranking
Parcel provides benefits to multiple species and/or benefits to additional non-covered species identified in the state Wildlife Action Plan	Benefits to non-covered species may result in a higher ranking
Opportunity to leverage other non-federal conservation funding	Positive opportunity results in higher raking

By protecting Covered Bat Species habitat and removing threats that affect survivorship, the long-term survival of local bat populations should remain stable or increase. Protection and enhancement of such local populations would thus increase the likelihood that bats in the population survive over time and continue contributing to the recovery of the species in addition to offsetting the impacts of the potential take of the bats during the operation of the Covered Projects. Other habitat enhancement and protection projects that provide immediate benefits will also be considered; however, the focus will be on projects that provide maternity habitat for Covered Bat Species.

Finally, in addition to selecting mitigation projects for implementation, the Technical Review Team will also evaluate selected projects over time to gauge the project effectiveness based on a combination of habitat preservation and restoration. Presence of Covered Bat Species alone will not be indicative of successful mitigation. For restoration projects, the team will assess characteristics such as the percent of invasive species coverage before and after project implementation, tree density and height at five and 10 years after project implementation, and tree species composition before and after any tree-planting activities. For habitat preservation projects, the team will assess characteristics such as the percent of invasive species coverage after protection and the number of dead standing snag trees per acre with exfoliating bark. Results of the assessments may be used to employ adaptive management decisions over the term of the permit to ensure that mitigation criteria continue to be met.

5.3.3.3.2 Covered Eagles

The Eagle Conservation Fund will be used exclusively to execute projects designed to have immediate benefits to eagles. These actions include, but are not limited to, the purchase of ownership interests or easements to protect eagles for the term of the ITP, including nesting or foraging habitat; public education initiatives on the negative impacts of toxic substances in the environment on eagles and other wildlife; implementing measures to provide non-toxic (i.e., lead free) ammunition and/or fishing tackle to local hunters and anglers; funding a local or regional eagle rehabilitation center actively involved in the treatment, rehabilitation, and re-release of wild eagles; implementing measures to educate farmers on appropriate disposal of farm animal carcasses; or reforesting woodlots and other blocks of habitat. Project criteria are:

1. Enhancement projects will occur within the State;

2. Enhancement projects will occur at sites that are known to be used by eagles or are assumed to have a high likelihood of being used by eagles based on proximity to known nesting and foraging sites;

3. Enhancement projects will occur in areas where there is an ability to manage a sustainable supply of nesting trees and habitats; and

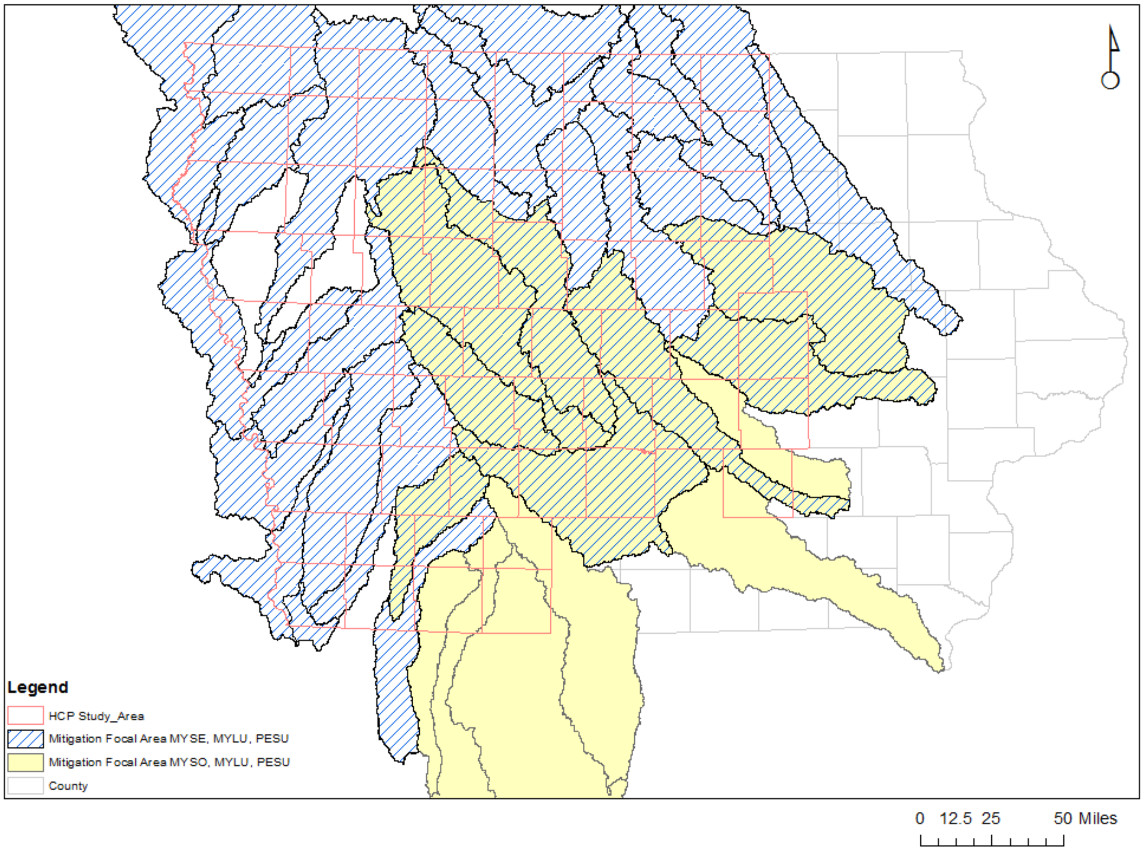
4. Key priorities for action are to protect nesting or foraging habitat, to facilitate reforestation of corridors between known nesting habitat and foraging areas, and to facilitate reforestation of woodlots and other blocks of habitat.

By protecting and enhancing eagle habitat and removing threats that affect survivorship, the long-term survival of eagle populations remain stable or increases. Protection and enhancement of such populations would thus not only increase the likelihood that eagles in the population survive over time, it will also help to offset the impacts of the potential take during the operation of the covered Projects.

5.3.3.3.3 Selection of Mitigation Projects

MidAmerican Energy, the USFWS, the INHF, and the IDNR will serve as the Technical Review Team to jointly select habitat enhancement projects presented by the INHF or others for the Covered Species (bats and eagles) that will contribute to the conservation and recovery of these species in the State. Projects located in HUC-08 high-conservation-value focal areas shown in Figure 5.3. Potential Mitigation Focal Areas may be prioritized for selection. The potential mitigation focal areas are not meant to prohibit selection of a mitigation project outside of these focal areas, but still within the state of Iowa, if such a project satisfies other applicable mitigation selection and prioritization criteria.

Potential Mitigation Focal Areas (HUC 08)



Potential mitigation focal area as indicated by MLE (BCID).

Figure 5.3. Potential Mitigation Focal Areas

Additionally, within these focal areas, projects that provide conservation benefits to both eagles and the Covered Bat Species will be prioritized for selection. Projects selected will comply with applicable agency policies, regulations, and planning documents relating to habitat conservation. MidAmerican and the USFWS will independently evaluate and approve the selected mitigation projects to ensure consistency with applicable permit conditions and other regulatory requirements.

Projects selected for funding will initially be implemented by the INHF, a nonprofit conservation organization that works with private landowners and public agencies to protect and restore Iowa's land, water, and wildlife. In the event that the INHF is unable to perform its duties, MidAmerican and the USFWS may jointly select an alternative entity to assist in the implementation of the conservation fund.

MidAmerican has entered into an agreement with the INHF to implement mitigation projects approved for funding by the Bat Conservation Fund and Eagle Conservation Fund. The agreement describes the process whereby the INHF will identify, review, recommend, and implement approved mitigation projects. The INHF will implement projects that have been agreed upon by MidAmerican, the USFWS, and the IDNR and approved by the USFWS. MidAmerican will provide the INHF notice of approved projects and payment from the designated escrow agent.

Thereafter, the INHF shall be responsible for completion of the projects with funds provided from the Bat Conservation Fund and Eagle Conservation Fund.

Other specific terms of the conservation fund and its administration include the following:

Payment Terms. On the next business day following the date the permit is issued, MidAmerican will make payments of $1.602 million and $4.347 million into separate interest-earning escrow accounts administered by a third party selected by MidAmerican and the USFWS.

Administration. The conservation fund will be held and administered by an interest-bearing escrow agent selected by MidAmerican and the USFWS. The approved escrow agent will adopt and implement escrow instructions for the release of mitigation funding in a form substantially similar to those attached as Appendix J (Escrow Disbursement Instructions).

Fees associated with fund administration will in no way diminish the amount of the conservation fund. To ensure this, the administrator will directly bill MidAmerican for associated fees and costs or include them as upfront costs in addition to the corpus of the fund, at the time the fund is established. However, interest earned on the principle of the conservation fund shall be used on an annual basis to pay fees and costs incurred by the Mitigation Entity to perform approved conservation projects.

Eligible Projects. Money will be disbursed from the conservation fund, at the direction of the USFWS, to fund projects that meet the goals, objectives, and criteria identified above. In accordance with the terms of the HCP, mitigation projects will be identified and implemented throughout the term of the ITP in a manner that allows the mitigation value to precede the impacts of the take.

Reporting. MidAmerican will submit an annual report to the USFWS by April 1 of each year detailing the status of mitigation implementation, including expenditures made during the preceding calendar year and the current balance of the funds as well as a summary of mitigation effectiveness monitoring. The conservation fund administrator and MidAmerican will each certify the accuracy of information contained in this report. These reports are intended to help the USFWS ensure that adequate funding will be provided to implement the HCP and that funding sources at the required annual levels are reliable and will meet the purposes of the HCP.

Adaptive Management. The adaptive management program relating to mitigation projects includes two components: (1) convening of a Technical Review Team[23], and (2) an adaptive responses process.

MidAmerican and the USFWS will convene meetings of the Technical Review Team annually. The Technical Review Team will assist in reviewing progress and priorities for specific mitigation projects and actions. Although adaptive management will be discussed at these meetings and adaptive management recommendations might be made, final adaptive management decisions will be made by the UFWS.

[23] MidAmerican has established the Conservation Funds to be administered in consultation with a Technical Review Team consisting of MidAmerican, the USFWS, the IDNR, and the INHF.

The results of mitigation effectiveness monitoring (as compiled in the annual reports) will be provided to the Technical Review Team for review and discussion. Based upon feedback obtained from the Technical Review Team, measures may be modified or discontinued with the agreement of MidAmerican and the USFWS.

In its review, the Technical Review Team will evaluate the habitat enhancement program at two levels. First, it will examine the effectiveness of individual mitigation projects to evaluate their performance relative to expectations and to recommend project-specific adjustments as needed. Second, the team will annually review the mitigation program as a whole to determine whether goals and objectives are being met. If sufficient projects are not available to meet specific goals and objectives (e.g., failure to find willing landowners or project proponents), the team will consider other projects that provide benefits to Covered Species and recommend adjustments in the program as necessary.

The team may also make recommendations to adjust the program if other projects or actions that provide greater benefits to Covered Species are identified over the ITP term as long as the projects adhere to the biological goals and objectives identified in this HCP. All adjustments must remain within the funding limits of the Conservation Funds.

5.3.4 Adaptive Responses Process for Mitigation Implementation

5.3.4.1 Circumstances Triggering Adaptive Responses

Adaptive management responses relating to completed conservation projects will occur in the following circumstances during the Permit term:

1. A particular objective cannot be implemented as planned; or

2. Effectiveness monitoring indicates that an objective is not being met.

If appropriate, given new information, MidAmerican and the USFWS, with the input of the Technical Review Team, may also reconsider specific projects and actions that have not yet been identified or implemented. In those cases, the merits and feasibility of substituting newly identified projects or actions could be discussed. The necessary adaptive response in these situations will be discussed by MidAmerican and the USFWS on a case-by-case basis.

5.3.4.2 Guidelines for Types of Adaptive Responses

If implementation of a different or substitute project/action is necessary, MidAmerican and the USFWS will use guidelines developed with the Mitigation Entity to aid prioritization and implementation. For example, revisions or replacement of projects or actions would be done in a manner that adheres to original objectives that emphasize similar actions at similar locations, or that achieves the same or equivalent habitat benefit for the same Covered Species populations.

5.3.4.3 Adaptive Response Decision-Making

An important element of the annual Technical Review Team meeting will be to discuss and consider possible adaptive management responses (for final adaptive management decisions made between MidAmerican and the USFWS). For the purposes of identifying and recommending possible adaptive management responses, the discussion will include but will not be limited to:

- Updated information on status and trends of Covered Species populations;
- Updated information on environmental factors (e.g., specific habitat conditions, disease, water quality) affecting Covered Species populations;
- Effectiveness of HCP measures implemented to date;
- New or additional opportunities for partnership efforts (e.g., to use MidAmerican funds to leverage additional resources from other sources);
- Verification or revision of priorities of projects under the Conservation Funds; and
- Need (if any) for adaptive management to meet HCP obligations.

MidAmerican and the USFWS will confer with the Technical Review Team on the science underlying the conservation measures funding by either Conservation Fund. The focus will be on whether the preponderance of the available scientific literature indicates that the original assumptions (or working hypotheses) for the conservation measures have changed enough to warrant an adaptive response.

Following the meetings with the Technical Review Team, MidAmerican and the USFWS will define the adaptive management actions necessary (if any) to ensure that adequate mitigation will be provided to fully offset the impacts of the taking for the Covered Species. MidAmerican and the USFWS will decide whether new measures should be selected and implemented, and if so, determine the specific measures. Final decisions will be made by MidAmerican and the USFWS based on what is required to maintain compliance with the ITP.

5.3.5 Costs for Implementing Adaptive Management Actions

Costs for implementing adaptive responses will be paid with the funding contributed to the Conservation Funds, MidAmerican's credit facilities, or other funding assurances as described in section 6.2.

MidAmerican's minimization and mitigation measures support the Company's purpose and need for the Wind Energy Projects to deliver non-carbon emitting energy towards its 100% renewables target within the Projects' regulatory cost caps, as well as the purposes of the HCP to assess Project impacts on Covered Species, provide mechanisms to avoid, minimize and mitigate those impacts, and ensure that incidental take will not significantly reduce the likelihood of Covered Species' survival and recovery. The HCP also evaluates the net effects of impacts in light of minimization and mitigation and demonstrates how the impacts of the taking have been fully offset.

5.4 Monitoring Plan

MidAmerican Energy has spent approximately $12 million to date to intensively study the Covered Projects, including post-construction monitoring at each Project, development of a particle dispersion model to inform a risk assessment of the Project and to design this conservation plan, and matching contributions for the Section 6 grant studies. As a result of this investment, MidAmerican has collected an extensive amount of species- and Project-specific data and is relying on these data to inform a monitoring plan for ITP compliance.

MidAmerican will conduct compliance monitoring at the Projects to monitor bat and eagle mortality and to ensure the levels of estimated take of these Covered Species remain within the levels of take authorized by the ITP (Sections 5.4.1 and 5.4.2, Appendix K). Take will be monitored throughout the year for all Covered Species, and more intensively for Covered Bat Species from July 1 through October 15 each year. Compliance monitoring will be completed with dedicated trained staff assigned during the monitoring period or, at the choice of MidAmerican, by a qualified contracted third party.

Operations and maintenance staff trained to search for and pick up carcasses for identification as part of their daily activities and routine visits to turbines will monitor the Projects year round. During all visits to Project turbines made by O&M staff, a visual scan of the turbine pad, access road and surrounding area will be conducted to look for bat and bird carcasses. Data sheets will be provided to MidAmerican's data evaluation and quality control consultant on a monthly basis to incorporate into the annual take calculations described in Appendix K. Visual scans have shown high searcher efficiency rates associated with an increase in field technician experience and familiarity with the search area and method (Bay et al. 2016a, WEST 2016).

O&M staff receive annual training on the search area and search method, including proper procedures for recording, handling and reporting of wildlife incidents that may occur at a Project. Training is designed to facilitate long-term self-monitoring of the Projects in support of the HCP and ITP and builds on the training MidAmerican implemented at the start of the HCP development process. Training sessions will be divided into two parts: a classroom session to review general procedures and reporting processes, and a field session to demonstrate the recording and handling process. Specifically, training will include methods for searching for bird and bat casualties; data recording; species identification; photographing finds; recording the event; procedure for handling, sampling, and storing carcasses; and recording other information important to the find. Bat species identifications and recommendations for positive genetic identification testing will be conducted by a qualified, USFWS-permitted biologist(s). All *Myotis* casualties and any bat casualty in a condition that does not allow positive identification (e.g., level of decay, absence of identifying characteristics, etc.) will be sent for genetic identification testing.

Maintenance and security visits are conducted a minimum of once per month at all turbines at all Projects. In addition, O&M staff typically perform scheduled preventative maintenance and unscheduled maintenance activities at an average four to five turbines per day throughout the year.

Searches conducted during monthly maintenance visits will be treated as standardized carcass searches and used for search interval and searcher efficiency estimates for bats and eagles. Data collected during other non-scheduled turbine visits and annual preventative maintenance visits will be treated as incidental finds consistent with standard monitoring protocols for finds made outside of the standard searches.

The compliance monitoring program was designed based on evaluation of the 2014-2017 studies, available information, USFWS HCP guidance, and the ITP compliance needs with the following objectives in mind:

- A cost-effective strategy that would provide the metrics necessary to monitor take of the Covered Species;
- A comprehensive system using O&M and other staff at all the Projects;
- A monitoring plan scaled to the geographic scope of the HCP;
- A monitoring plan that would provide MidAmerican the ability to evaluate results annually; and
- A monitoring plan designed to facilitate evaluation of thresholds that would indicate whether and when an adaptive management or changed circumstance response may be needed to maintain Permit compliance.

The purpose of the ITP compliance monitoring is to demonstrate compliance with the Permit. ITP compliance monitoring will estimate bat and eagle mortality using the IEoA approach (see Section 4.2, Section 4.3, and Appendix D) for bats and the EoA approach for eagles, from which the total incidental take of Covered Species will be estimated. Of all currently available analytical methods for estimating take, the EoA-like methods (EoA and IEoA) provide the most precise estimates (see Section 4.2.1 and Appendix D) and therefore are considered the most reliable for assessing permit compliance and need for adaptive management response. The result will provide the information necessary to monitor and track compliance with the ITP. At the end of each monitoring period, annual Covered Bat Species and eagle take will be evaluated with the IEoA or EoA model to estimate annual take, project potential future take, and determine whether any adaptive management or changed circumstance triggers have occurred. Over the term of the IPT, newly available estimators other than IEoA or EoA may be used if agreed to by both MidAmerican and the Service following the steps identified in Section 8.2.5.

Compliance monitoring for the HCP will be conducted annually for the duration of the permit. In addition to the year-round monthly searches focused on eagles, MidAmerican will also conduct weekly road-and-pad searches at each turbine between July 1 and October 15 to increase effectiveness of monitoring for bats (see Table 5.7). This period coincides with the period of highest bat fatalities recorded during the 2015 and 2016 monitoring studies. Searcher efficiency and carcass removal trials will be conducted according to a pre-determined schedule to provide data for correcting the observed number of carcasses for these biases. Additional details related to the compliance monitoring are found in Appendix K. If the results of any Annual Monitoring confirm that an adaptive management threshold has been or may be triggered, MidAmerican Energy will respond via the adaptive management protocol (Section 5.5).

Table 5.7. Monitoring Protocol for the MidAmerican Energy Company's Wind Energy Projects.

Monitoring Phase	Permit Year	Number of Turbines Searched	Search Interval	Search Period
Annual Monitoring	Years 1-30	Bats: Road-and-pad searches at 100% of turbines at all Projects Eagles: Road-and-pad searches with 100-meter visual scans (unless precluded by vegetation) at 100% of turbines at all Projects	Bats: minimum once monthly at all Projects plus once per week at all Projects for focused search period Eagles: minimum once per month	Bats: 12 months, plus an 15-week period from July 1 to October 15 Eagles: 12 months

5.4.1 Take Estimation Methods for Bats

MidAmerican will estimate annual bat take and, in combination with prior years' estimates and current projections, determine, for all Covered Bat Species, the likelihood that cumulative take will exceed either the Implementation Take or Authorized Take. Adaptive Management decisions will be made at Decision Meetings conducted every five years, as described in Section 5.5. The compliance monitoring data will provide the basis of these analyses. IEoA will be used each year to calculate the current year's bat take and the variance of that estimate. When informing the IEoA model, running weighted averages of species composition estimates, with more weight given to the most recent data, will be used and will be computed from MidAmerican-specific data when possible (see Addendum 1 of Appendix K). IEoA assumes the total number of Covered Bat Species fatalities (M) follows a Poisson distribution,

$$M \sim Poisson(\lambda),$$

where λ is the rate at which bat fatalities occur at the covered facilities. Past Covered Bat Species annual point estimates of take (50th quantile of posterior take distribution) will be summed to calculate cumulative take to the present year. For the purposes of projecting bat take over the remainder of the ITP term, the mean of the annual take estimates from the most recent three years will be assumed to apply to all remaining years of the ITP. The cumulative take to the present year plus the projected take will estimate the cumulative take at the end of the ITP term. The variance of the cumulative take will be computed as part of the analysis and used to determine the likelihood that cumulative take will exceed the Implementation Take or Authorized Take.

5.4.2 Take Estimation Methods for Eagles

MidAmerican will estimate annual eagle take and, in combination with prior years' estimates and current projections, determine the likelihood that cumulative take will exceed the Authorized Take. Adaptive Management decisions will be made at Decision Meetings conducted every five years, as described in Section 5.5. The data collected during compliance monitoring will provide the basis of these analyses. The Evidence of Absence (EoA) framework or another estimator agreed upon with USFWS will be used each year to calculate the current year's eagle take and the variance of that estimate for evaluation of compliance with the ITP and adaptive management decisions

(Dalthorp et al. 2017). EoA assumes the total number of eagle fatalities (M) follows a Poisson distribution,

$$M \sim Poisson(\lambda),$$

where λ is the rate at which eagle fatalities occur at the covered facilities. M at the 50th credible interval will be used to estimate annual eagle take each year and cumulatively over the ITP term. The Multiple Years module in the EoA framework will be used to estimate the cumulative take and determine the likelihood that cumulative take will exceed Authorized Take.

5.5 Adaptive Management for Take Compliance

Adaptive management is commonly used as a method to address uncertainty in natural resources management. Broadly defined, it is a method for examining alternative strategies for meeting biological goals and objectives, and then, if necessary, adjusting future conservation management actions as needed according to what is learned. The purpose of adaptive management is to ensure that take levels do not exceed the limits predicted in the HCP and authorized in the ITP. Therefore, the adaptive management framework is designed to trigger additional minimization or mitigation if cumulative annual take is on pace to exceed the ITP limits or to ensure that the impacts of the take have been fully offset. An appropriate adaptive management framework also allows for reduced minimization following adaptive management changes if the annual take is predicted to be less than the ITP limits, indicating that reduced minimization back to baseline measures (blade feathering below the normal turbine cut-in wind speed) would maintain take below the ITP limits.

The Projects will be monitored for the duration of the Permit to assess the level of take of Covered Species and assess the effectiveness of the seasonal turbine operational adjustment protocol in reducing bat mortality. MidAmerican will consult with the USFWS to interpret the results of the monitoring surveys, evaluate new available data from the monitoring, determine the appropriate timing for providing addition mitigation and, if needed, adjust onsite minimization strategies to ensure the level of Authorized Take is not exceeded over the 30-year term of the ITP. Because it is difficult to predict every possible scenario and annual variation is anticipated given the scope and scale of the HCP and MidAmerican's Projects, it is inappropriate to use monitoring data from any one year to trigger adaptive management. MidAmerican will establish two levels of assessment: annual Evaluation Meetings and periodic Decision Meetings.

In March of each year, MidAmerican and USFWS will meet to review and evaluate compliance monitoring results from the previous year. These Evaluation Meetings will be used to assess cumulative take, confirm assumptions from the BO concerning the impacts of Covered Species population changes, and evaluate other circumstances associated with the monitoring data and estimated take, such as potential geographic or Project-specific variability in estimated take. Evaluation Meetings will also review results of previous meetings and will determine whether Changed Circumstances may have occurred. MidAmerican will continue to implement the HCP after an Evaluation Meeting. If a changed circumstance has occurred, MidAmerican will follow the response actions identified in Chapter 8.

The annual meeting that takes place every fifth year of the permit term (i.e., beginning in March of the fifth year) will be a Decision Meeting to determine whether adaptive management measures have been triggered, and if so, the action(s) MidAmerican will take in response to the trigger(s).

The outcome of a Decision Meeting will be one of three options: (1) no change; (2) for Covered Bat Species, conduct a mitigation true-up and/or implement operational adjustments or technologies to reduce the rate of take of Covered Bat Species; and/or (3) for all Covered Species, seek a permit amendment. At each Decision Meeting, MidAmerican and the USFWS will assess (1) estimated cumulative take; and (2) the projected rated of take for the remaining permit term, based on the best-fit rate of take from the previous five years of data.

5.5.1 Bat Adaptive Management

MidAmerican's Covered Bat Species adaptive management protocol (Table 5.8) will inform contributions to the Bat Conservation Fund and changes to operational parameters at certain Projects, if needed, to ensure MidAmerican stays within the Authorized Take. Accordingly, MidAmerican has established adaptive management triggers and responses that would accelerate a mitigation true-up, require operational adjustments, or both, if the rate of take is greater than the rate of Authorized Take (see Table 4.2). In addition, at the first Decision Meeting, MidAmerican and the USFWS will review the data compiled in the Section 6 planning grant studies to confirm the parties' understanding of bat migration through the State.

Table 5.8. Covered Bat Species Adaptive Management Triggers and Response Actions.

Adaptive Management Response Level	If Review Period Indicates that Cumulative Take is:	The Response is:
Level I	Projected ≤ Implementation Take	No changes, continue implementing the HCP
Level II	Projected > Implementation Take but ≤ Authorized Take	Plan to conduct mitigation true-up in years 15 and/or 25
Level III	Projected > Authorized Take	Reduce take rate to below Authorized Take by targeted curtailment and/or deterrent deployment *and/or* Conduct mitigation true-up if Adaptive Management Response was also triggered at an earlier Decision Meeting *and/or* Amend permit if cumulative take + projected take would exceed Authorized Take

MidAmerican acknowledges that a mitigation true-up may be necessary during the 30-year permit term. A mitigation true-up will be required if actual estimated take up to a given period is greater than the amount of take that has been mitigated. In order to ensure that mitigation is staying ahead of the take, MidAmerican will deposit funds in the Bat Conservation Fund (see Section 5.3.3.3) and mitigation lands management fund in an amount that will mitigate for the estimated take greater than the Implementation Take, plus an amount equal to the take that would result from the same take rate projected over the remaining permit term, up to Authorized Take. Mitigation true-up funds will be deposited into the two escrow accounts within 30 days of the Decision Meeting at which the true-up was shown to be warranted. The amounts deposited into the escrow accounts will be calculated on a per acre basis using current costs for mitigation actions at the time of the Decision Meeting.

The Decision Meetings subsequent to a mitigation true-up will compare projected take to the overall level of Mitigated Take, which comprises Implementation Take and True-up. MidAmerican intends to conduct any necessary mitigation true-ups in years 15 and 25, unless adaptive management triggers require a true-up to occur earlier in the permit term (see Table 5.6).

However, should Level III be triggered in each of the first two Decision Meetings, MidAmerican will conduct a mitigation true-up in Year 10 of the permit. Finally, if the mitigation needed to compensate for the projected take rate is calculated to be higher than 1,309 acres and 25 artificial structures at year 15, a mitigation true-up will be conducted prior to the scheduled mitigation true-up at year 15, per Level II above. This will ensure that mitigation does not lag behind take.

5.5.1.1 Additional Actions

If a fatality of a Covered Bat Species is discovered at a Project, MidAmerican Energy will notify USFWS within 48 hours of positive species identification and evaluate available data concerning the discovery. Positive identification will be obtained through typical species identification procedures and genetic testing, if necessary. Discovery of a Covered Bat Species fatality does not necessarily indicate that the take limit will be exceeded, and therefore, does not necessarily trigger the need for adaptive management actions or operational changes. Rather, such a fatality will be evaluated in the context of the circumstances related to the fatality, when it occurs during the ITP term, and the likelihood such take signals the need for additional actions.

If, during the Permit term, MidAmerican has implemented turbine operational changes to reduce bat mortality and monitoring has confirmed that take has dropped back down such that the authorized take limit would not be exceeded over the remaining Permit term, MidAmerican may elect to return to the baseline minimization measures (e.g., feathering below manufacturer's cut-in speed). MidAmerican and the USFWS will evaluate at Decision Meetings whether to return to baseline minimization measures if the company calculates that there is a 90% or greater likelihood that Authorized Take will not be exceeded for the remainder of the Permit term.

5.5.2 Eagle Adaptive Management

Eagle fatality estimates will be based on the results of the annual monitoring program, where a carcass fatality estimator will be used that considers the number of eagles found as well as carcass persistence rates, searcher efficiency, and the probability that an eagle would fall into a searched area. An EoA estimator will be used to calculate fatality estimates for eagles. However, an alternative estimator could be used if improved techniques become available and are agreed to by MidAmerican and the USFWS (see Section 8.2.5).

MidAmerican's eagle adaptive management protocol (Table 5.9) will ensure MidAmerican stays within the Authorized Take. Through the adaptive management process, MidAmerican will implement up to three levels of responses to triggers as determined through the compliance monitoring, including no changes and two potential triggers that could lead to a Permit amendment.

If, at a Decision Meeting, USFWS and MidAmerican conclude that projected future take, based on the most recent five-year average take rate, may exceed Authorized Take for eagles, an adaptive management response will be triggered. The first level of response (Level II) is to assess local and regional eagle population trends to determine whether a Permit modification is warranted to reflect an increased eagle population. MidAmerican will also evaluate the implementation of conservation practices, which could include but are not limited to, the seasonal application of monitoring programs in conjunction with detection and deterrent systems. The second level of response (Level III) is to implement conservation practices evaluated at Level II and seek a Permit amendment.

Table 5.9. Bald Eagle Adaptive Management Triggers and Response Actions.

Adaptive Management Response Level	If Review Period Indicates that Cumulative Take is:	Response:
Level I	Projected ≤ 90% of Authorized Take	No changes, continue implementing the HCP
Level II	Projected > 90% of Authorized Take	Evaluate current eagle populations and/or eagle use in area to assess need for permit amendment, including potential surveys for new eagle nests within 1.6 miles of facility turbines by a qualified biologist *and/or* Implement and test the effectiveness of conservation measures to further avoid or minimize risk to eagles. These conservation measures could include, but are not limited to, the seasonal application of monitoring programs in conjunction with light/noise/drone deterrent systems and/or intensification of carrion monitoring and removal programs
Level III	Projected > Authorized Take	Implement and test the effectiveness of conservation measures to further avoid or minimize risk to eagles. These conservation measures could include, but are not limited to, the seasonal application of monitoring programs in conjunction with light/noise/drone deterrent systems and/or intensification of carrion monitoring and removal programs *and/or* Amend the ITP

5.5.2.1 Additional Actions

If an eagle fatality is discovered at a Project, MidAmerican Energy will notify USFWS within 48 hours of positive species identification to evaluate available data concerning the discovery. Positive identification will be obtained through typical species identification procedures and genetic testing, if necessary. If an injured eagle is found at a Project, MidAmerican will coordinate with the USFWS or its designee concerning potential capture and/or transport of the injured eagle to a wildlife rehabilitator, and concerning the removal or modification of sources of new or previously unknown eagle attractants near Project turbines. Discovery of a bald eagle fatality or injury does not necessarily indicate that the take limit will be exceeded, and therefore, does not trigger the need for adaptive management actions or operational changes. Rather, such a discovery will be evaluated in the context of the circumstances related to the fatality or injury, when it occurs during the ITP term, and the likelihood such take signals the need for additional actions.

If a new eagle nest is identified within 2.6 km (1.6 miles) of a turbine at a Project[24], MidAmerican will monitor eagle use of the nest site and surrounding habitats and discuss monitoring results with USFWS. If increased eagle activity is observed at a Project by trained personnel, MidAmerican will monitor eagle activity and continue to implement the HCP.

[24] If a bald eagle nest is within 2.6 km of a turbine, there is the potential that that turbine would fall within the nesting territory of that eagle. This is conservatively based on the largest bald eagle nesting territory size found in the published literature (Garrett et al. 1993).

5.6 Habitat Conservation Plan Reporting

MidAmerican Energy will gauge compliance with and effectiveness of the HCP and provide an annual report to the USFWS by March 31 of the following year. The annual report will include but will not be limited to the following:

- Summary of monitoring conducted during the year;
- Annual and cumulative mortality estimates of the Covered Species and the methods used the calculate the estimates;
- Summary of effectiveness of minimization measures, where appropriate;
- Projected mortality estimates and whether or not adaptive management triggers were met;
- Responses to adaptive management triggers implemented;
- Summary of funding released and planned mitigation projects;
- Mitigation true-up actions completed if triggered and applicable; and
- Status of conservation fund/funding assurances.

MidAmerican will also develop an annual mitigation report detailing the status of mitigation projects and responses to mitigation adaptive management protocols. The mitigation report will be shared with the Technical Review Team by March 31 each year.

6.0 IMPLEMENTATION AND FUNDING

The costs of implementing the HCP will be funded through MidAmerican's available sources of liquidity, including credit facilities credit facility, and assured through MidAmerican's self-bonding and indemnity agreement, or, as necessary, through a letter of credit.

6.1 Costs to Implement the Habitat Conservation Plan

Costs to implement the HCP include the development and implementation of mitigation projects, compliance and effectiveness monitoring and reporting, and general HCP administration and management costs. MidAmerican has available a variety of sources of liquidity and capital resources, both internal and external, including net cash flows from operating activities, public and private debt offerings, the issuance of commercial paper, the use of unsecured revolving credit facilities, and other sources. These sources are expected to provide funds required for current operations, capital expenditures, debt retirements and other capital requirements associated with the HCP.

The anticipated administrative costs for this HCP include program management and oversight, training, compliance monitoring, and other incidental costs (Table 6.1). Most of these administrative costs are internal personnel costs. MidAmerican intends to use existing staff to provide management and oversight for HCP and ITP compliance and most routine training activities. MidAmerican provides management and oversight for natural resources, training, and environmental compliance program areas. Personnel costs associated with wind operations employees and contractors attending required HCP training programs are included in MidAmerican's existing staff overhead expenses. These administrative costs are funded as annual operating expenditures. With the Annual Report each year, MidAmerican will provide to the Service a letter certifying that funding has been allocated to pay for contractors and staff who will be responsible for administration of the HCP and compliance monitoring. Funding allocated for these purposes will be calculated based on previous years' costs. Failure to demonstrate that sufficient funding is available and allocated for administrative and monitoring costs, described in table 6.1, may result in the suspension or revocation of the permit.

Table 6.1. MidAmerican Energy Company's Habitat Conservation Plan Administrative Costs.

Description	One Time Costs	Annual Costs
Personnel and Training		
Environmental Services staff time	$ -	Covered by existing overhead
Operations staff trainee time	$ -	Covered by existing overhead
Training Materials	$15,000.00	$ -
Monitoring and Reporting		
Incidental and Monthly Covered Species Scans by O&M Staff	$ -	$180,000.00[25]
Annual Bat Intensive Monitoring	$ -	$850,000.00
Bat Identification (genetic testing)	$ -	$ 10,000.00
Annual Report and Agency Meeting	$ -	$ 10,000.00
Total	**$15,000.00**	**$1,050,000.00**

Note: All costs furnished are estimates based on completed contracts for comparable work with qualified biological consulting firms. Genetic testing estimates are based on past fees associated with genetic bat identification lab analysis. Actual costs may vary.

In addition to administrative costs, MidAmerican has estimated costs to implement adaptive management measures described in Section 5.5 and changed circumstances described in Section 8.2 (Table 6.2). If triggered, these costs will be funded by MidAmerican's credit facility and assured through MidAmerican's self-bonding and indemnity agreement, or other form of assurance as described in Section 6.2.

[25] Incidental and monthly scan costs are provided for informational purposes. The incidental and monthly wildlife scans are completed as part of O&M technicians existing job duties and are attendant to the performance of wind facility operation and maintenance activities. Because these operation and maintenance activities are anticipated to continue as long the wind facilities continue to operate and are covered by existing overhead.

Table 6.2. Estimated Costs of Adaptive Management Responses.

Implementation Measure	Description	Estimated Cost
Adaptive Management		
Level II – bats	Mitigation true-up	Estimated at $11,156,900 (see § 5.5.1)
Level III – bats	Targeted curtailment and/or mitigation true-up	No new costs for targeted curtailment – programming in place and/or see § 5.5.1
Level II – eagles	Eagle nest/use/population surveys: $12,000 per site, 21 sites	$252,000
Level II – eagles	Additional conservation measures (i) deterrent technologies are not yet commercially available, so costs are not calculable (ii) carcass monitoring and removal: $14,000 per site, 21 sites	$294,000
Level III – bats and eagles	Amend permit	$250,000
Changed Circumstance		
8.2.1	Presence/absence survey: $21,000 per site, 5 sites	$105,000
8.2.2	Population viability study	$10,000
8.2.7	Natural disasters affecting mitigation land	Up to 10% of mitigation fund ($379,610)

6.2 MidAmerican Energy Company Funding

The specific costs associated with adaptive management and Changed Circumstances are impossible to precisely estimate because they are dependent on future events and on information that will not be available until after the HCP is implemented and performance is monitored. However, estimated costs available at the time of this document are provided in Chapters 5, 6, and 8.

As of December 31, 2018, MidAmerican maintained credit facilities totaling $905 million. MidAmerican has a $900 million unsecured credit facility expiring in June 2021. MidAmerican may request that the banks extend the credit facility up to one year. The credit facility, which supports MidAmerican's commercial paper program and its variable-rate tax-exempt bond obligations and provides for the issuance of letters of credit, has a variable interest rate based on the Eurodollar rate or a base rate, at MidAmerican's option, plus a spread that varies based on MidAmerican's credit ratings for senior unsecured long-term debt securities. Additionally, MidAmerican has a $5 million unsecured credit facility for general corporate purposes. The $900 million credit facility requires that MidAmerican Energy's ratio of consolidated debt, including current maturities, to total capitalization not exceed 0.65 to 1.0 as of the last day of any quarter. As of December 31, 2018, MidAmerican Energy was in compliance with the covenants of its credit facilities. MidAmerican Energy has authority from the FERC to issue commercial paper and bank notes aggregating $1.3 billion through July 31, 2020. Together, the facilities provide a reasonable cushion of short-term liquidity for general corporate purposes, including capital expenditure needs. Capital expenditure needs are reviewed regularly by management and may change significantly as a result of these reviews, which may consider, among other factors, changes in environmental and other rules and regulations; impacts to customers' rates; outcomes of regulatory proceedings; changes in income tax laws; general business conditions; load projections; system reliability standards; the cost and efficiency of construction labor, equipment, and materials; commodity prices; and the cost and availability of capital. MidAmerican will maintain credit facilities throughout the Permit term, absent a significant structural change in the electric and natural gas utility industry. Thus, MidAmerican proposes to fund its non-mitigation obligations based on its own credit rating or financial fitness. As described in 30 CFR § 800.23(b)(3)(i), MidAmerican meets and exceeds this requirement as of January 8, 2019. MidAmerican's Standard and Poor credit rating was A+ and MidAmerican's Moody credit rating was Aa2. MidAmerican will submit an update of all of the financial information referred to in 30 CFR § 800.23(b)(4) within 90 days after the close of each fiscal year following the issuance of the ITP in order to demonstrate its continued financial fitness to self-bond its non-mitigation financial assurance.

If, at any time during the term of the ITP, MidAmerican's financial conditions change so that the credit rating criteria of 30 CFR § 800.23(b)(3)(i) are no longer satisfied, MidAmerican shall notify the Service immediately and shall, within 90 days, post acceptable security of $860,000 for Annual Bat Intensive Monitoring in either cash to fund an escrow account, or a letter of credit in a form acceptable to the Service, and of sufficient duration and amount to assure its obligations under the HCP within 30 days.. If the change in financial conditions occurred prior to or concurrent with an adaptive management response and/or a changed circumstances response, MidAmerican will post a separate letter of credit sufficient to satisfy those obligations (triggered adaptive management measures and/or changed circumstances). The acceptable security shall remain in place and renew annually until such time that MidAmerican's credit ratings is "A" or higher from S&P or Moody's.

Should MidAmerican fail to provide cash or a letter of credit, such failure would provide valid grounds to suspend and/or revoke the permit in accordance with 50 C.F.R. §§ 13.27 and 13.28.

6.3 Mitigation Funding

The REA model calculates that to offset the impact of Authorized Take of Covered Bat Species, 3,200 acres of summer habitat protection and/or restoration is needed. The cost to protect and/or restore 3,200 acres of suitable bat habitat is estimated to be $3,000/acre, for a total mitigation responsibility of up to $10.1 million over the 30-year term of the ITP (See Table 5.4). The REA models calculate a mitigation responsibility for Implementation Take of 1,309 acres, or $3,927,000; and 42 artificial structures, or $420,000. MidAmerican will initially fund the Bat Conservation Fund up to Implementation Take. On the next business day following the date the permit is issued, MidAmerican will deposit $4,347,000 into an interest-earning escrow account for Covered Bat Species mitigation projects, with the Mitigation Entity listed as the initial beneficiary. As explained in the adaptive management protocol (see Section 5.5), MidAmerican will calculate the amount of Covered Bat Species take that has occurred over the Permit term and may contribute additional mitigation funding (mitigation true-ups) to the Bat Mitigation Fund, if needed, to ensure mitigation levels stay ahead of take projected to occur over the remaining term of the ITP, up to the total level of Authorized Take.

MidAmerican and INHF have separately negotiated a mitigation lands management fee of approximately $2,900/acre for a total of $3,796,100 for Implementation Take mitigation and up to $9,280,000 for Authorized Take mitigation. The management fee will cover the cost of implementing bat conservation actions including, but not limited to, tree planting, vegetation management, installation of habitat enhancement features such as artificial roots or girdling existing trees, landowner outreach, bat monitoring, mitigation performance monitoring, and restoration coordination. On the next business day following the date the permit is issued, MidAmerican will deposit $3,796,100 into an interest-earning account for mitigation lands management, with the Mitigation Entity listed as the initial beneficiary. Should mitigation true-ups be triggered under the Covered Bat Species adaptive management protocol, MidAmerican will add additional funds to this management account, up to the amount corresponding to Authorized Take.

On the next business day following the date the permit is issued, MidAmerican will also deposit $1,602,000 into an interest-earning escrow account for bald eagle mitigation projects, with the Mitigation Entity listed as the initial beneficiary. The size of the contribution will be calculated at the beginning of the Permit and include $5,340/eagle/year for the estimated eagle fatalities associated with the Projects over the Permit term (see Appendix I). The total proposed mitigation amount to compensate for the take of up to 300 bald eagles is $1,602,000.

Money from these mitigation accounts will be used by MidAmerican and/or the Mitigation Entity to fund habitat acquisition and enhancement activities for bats and eagles selected with input from the USFWS, initial mitigation project documentation and monitoring efforts, and contingencies needed through adaptive management and Changed Circumstances. Long-term mitigation monitoring and reporting will be the responsibility of the Mitigation Entity or partnering conservation organization property owner.

Administration. The conservation funds will be administered by a USFWS-approved agent or qualified conservation organization. Fees associated with fund administration will in no way diminish the amount of the conservation fund. To ensure this, the administrator will directly bill MidAmerican for associated fees and costs or include them as upfront costs in addition to the corpus of the fund, at the time the fund is established.

Eligible Projects. Money will be disbursed from the mitigation fund with the consent of the USFWS to fund projects that meet the goals, objectives, and criteria identified in Section 5.3. Initial conservation projects will be identified and implemented within five years after ITP issuance.

Reporting. MidAmerican will submit an annual report to USFWS by April 30 of each year detailing expenditures made during the preceding calendar year and the current balance of the mitigation fund. The mitigation fund administrator and MidAmerican will each certify the accuracy of information contained in this report. These reports are intended to help the USFWS ensure that adequate funding will be provided to implement the HCP and that funding sources at the required annual levels are reliable and will meet the purposes of the HCP.

7.0 ALTERNATIVES TO THE TAKING CONSIDERED

Section 10(a)(2)(A)(iii) of the ESA and its regulations (50 C.F.R. §§ 17.22(b)(1), 17.32(b)(1), and 22.2), require an HCP to provide a description of "what alternative actions to such taking the applicant considered and the reasons why such alternatives are not being utilized." USFWS guidance for developing HCPs suggests to detail among other things, "alternative actions the applicant considered that would not result in take and the reasons why such alternatives are not being utilized," as well as actions that would reduce the take (USFWS and NMFS 2016; Section 5.6).

Because the Projects are already constructed and operating, the only available take alternatives for MidAmerican are limited. The only take avoidance alternative would be long-term operation under turbine operational adjustments recommended by the USFWS for avoiding take of these species. Similarly, take minimization measures would involve long-term turbine operational adjustments at something less than full avoidance.

Under the avoidance alternative for bats, Project turbines would be fully feathered at wind speeds below 6.9 m/s (22.6 ft/s) from sunset to sunrise during the bat active season (April 1 through November 15). Under an avoidance strategy for bald eagles, Project turbines would be fully feathered at any wind speed when eagles are present in the Project and at of risk of being struck by turbine blades. These strategies could potentially be modified, depending on available data related to the temporal presence of the Covered Species in the vicinity of a Project, but would still involve feathering all turbines and thus forego energy production when the Covered Species are present or are likely present (e.g., from sunset to sunrise for the bat species). With the Projects implementing these turbine operational adjustments, there is a reasonable expectation that take of INBAs, NLEBs, LBBAs, TRBAs, and bald eagle would be avoided and unlikely to occur. Under the avoidance alternative, because take of the Covered Species would be unlikely, incidental take authorization under the ESA would not be necessary and an HCP would not be implemented for the Projects. MidAmerican Energy did not select this avoidance alternative because it would not meet the company's purpose and need for the Projects and the HCP, which are to maximize low-cost, reliable renewable energy generation in support of MidAmerican Energy's 100% renewables vision while providing conservation benefit to Covered Species through the HCP framework (see Section 1.3).

Under the take minimization alternative for bats, Project turbines would be fully feathered at a wind speed greater than manufacturer's cut-in speed but less than 6.9 m/s from sunset to sunrise during the bat active season (April 1 through November 15). Under a take minimization alternative for eagles, MidAmerican would implement a formal weekly carrion removal program within a 0.4 km (0.25 mile) of each Project boundary on company-controlled land. MidAmerican did not select this take minimization alternative because it does not meet the purpose and need for the Projects as described in Section 1.3, nor does it correspond to the seasonal and geographical differences in risk to Covered Species identified from MidAmerican's monitoring data (see Section 5.3).

8.0 HABITAT CONSERVATION PLAN ADMINISTRATION

MidAmerican will implement the HCP upon approval of the HCP and issuance of the ITP, in coordination with the USFWS. MidAmerican is solely responsible for meeting the terms and conditions of the ITP and will allocate sufficient personnel and resources to ensure effective implementation of the terms and conditions of the HCP. MidAmerican expects that management of mitigation lands will be carried out by a conservation trust or other appropriate conservation organization. Monitoring is expected to be carried out by trained personnel with knowledge in conducting avian and bat fatality searches at wind facilities (for post-construction mortality monitoring) and by an appropriate conservation organization (for mitigation monitoring). MidAmerican and the USFWS will meet at least annually throughout the ITP term. The objective of the annual meetings will be to review annual mortality and mitigation monitoring reports to determine the need for adjustments to minimization, monitoring and mitigation in accordance with the adaptive management criteria identified in Chapter 5. Additional objectives of annual meetings will be to evaluate the potential application of new scientific findings to the adaptive management of this HCP and to evaluate the occurrence of Changed or Unforeseen Circumstances. Additional meetings or conferences may be initiated by MidAmerican and/or the USFWS to address other concerns, as necessary, including implementation and results of conservation measures.

8.1 Changed and Unforeseen Circumstances

Implementing regulations for Section 10 of the ESA recognize that revisions to the original HCP may be required as circumstances and information may change. 50 C.F.R. 17.22(b)(1)(iii)(C) requires that ". . . any plan approved for a long term permit will contain a procedure by which the parties will deal with unforeseen circumstances." Circumstances that can be reasonably anticipated and planned for are considered Changed Circumstances, and include new ESA listing of a species or a natural catastrophic event in areas prone to such an event. Unforeseen Circumstances are defined as changing circumstances that were not or could not be anticipated by HCP participants and the USFWS and that result in a substantial and adverse change in the status of the Covered Species. (USFWS and NOAA HB 1996). During the term of the ITP, MidAmerican and USFWS recognize that both anticipated or Changed Circumstances and unanticipated or Unforeseen Circumstances may occur.

MidAmerican Energy is subject to the Federal "No Surprises" assurances rule (codified at 50 C.F.R. §§ 17.22(b)(5), 17.32(b)(5)). As detailed in the rule and Federal Register notice adopting the rule, as long as MidAmerican is properly implementing the HCP and the ITP, no additional commitment of land, water, or financial compensation will be required with respect to Covered Species, and no restrictions on the use of land, water, or other natural resources will be imposed beyond those specified in the HCP without the consent of the MidAmerican.

The "No Surprises" Rule has two major components: Changed Circumstances and Unforeseen Circumstances. The term Changed Circumstances means changes in circumstances affecting a species or geographic area covered by an HCP that can reasonably be anticipated and that can be planned for (e.g., the listing of new species or a fire or other natural catastrophic event in areas prone to such events) (50 C.F.R. §§ 17.3). Unforeseen Circumstances are defined as changes in circumstances affecting a species or geographic area covered by an HCP that could not reasonably have been anticipated by plan developers and the USFWS at the time of the negotiation and development of the HCP and that result in a substantial and adverse change in the status of a covered species (50 C.F.R. § 17.3).

8.2 Changed Circumstances

Take of Covered Species occurring during the implementation of conservation and mitigation pursuant to Changed Circumstances provided under the HCP shall be covered take under the ITP so long as MidAmerican remains in compliance with the provisions of the HCP and the ITP. The Service reserves the right under 50 C.F.R. § 17.22(b)(8) to revoke the permit in the event the permitted activity would be inconsistent with the criterion set forth in Section 10(a)(2)(B)(iv), 16 U.S.C. § 1539(2)(a)(B)(iv), of the ESA and the inconsistency has not been remedied in a timely fashion.

As discussed in the HCP Handbook with respect to changed circumstances, the HCP should discuss measures developed by the applicant to meet such changes over time, possibly by incorporating adaptive management measures for covered species in the HCP (HCP Handbook, Section 10.5). HCP planners are required to identify foreseeable circumstances in advance and identify specific responses in the HCP for dealing with them, along with funding assurances to implement the responses. MidAmerican has identified impacts to Covered Species from WNS, potential changes in risk of take of the Covered Species due to expansion or changes in species range, the listing of new species, the discovery of a previously unknown hibernaculum or maternity colony near an operating Project, changed technologies/techniques, natural disasters affecting mitigation lands, and a mass fatality event of a Covered Species as Changed Circumstances warranting consideration and planning in this HCP.

8.2.1 Change in Covered Bat Species Spatial or Temporal Range within the Planning Area

The ongoing effects of climate change make it reasonably foreseeable that the phenology and/or spatial range of the Covered Bat Species may change. These changes could result in changes in the timing of spring and fall migration and to the distribution of the Covered Bat Species in the HCP Planning Area. For example, warmer temperatures may allow INBAs, NLEBs, LBBAs, and TRBAs to leave hibernacula earlier and remain in summer habitat longer, pushing the dates of spring migration earlier in the year and the dates of fall migration later in the year.

8.2.1.1 Trigger

The USFWS notifies MidAmerican of a shift in range in Iowa for one or more of the Covered Bat Species, either in peer-reviewed literature or recorded by or reported to or by the USFWS.

8.2.1.2 Response

MidAmerican Energy will conduct a survey following current USFWS approved survey protocol(s) to evaluate the presence/absence of one or more of the Covered Species within the Project area for all Projects within the revised range of the species. If no individuals of the Covered Species are detected, MidAmerican will continue to implement the HCP without change. If individuals of a Covered Bat Species are detected in this new range, MidAmerican will evaluate and adjust the species composition ratios and number of Projects within the species' revised range that are used to inform evidence of absence as explained in Appendix D. This will inform MidAmerican's annual take analysis and be used in the adaptive management evaluations (see Section 5.5.1, Table 5.8). In addition, MidAmerican will evaluate the risk to the Covered Bat Species from the Project(s) within the revised range of the species and determine the need for implementing minimization measures that may include but are not limited to implementing curtailment at the Project(s), deploying bat deterrent technology, and/or seeking a permit amendment. Based on other presence/absence surveys MidAmerican has commissioned recently, surveys are expected to cost approximately $20,000 per site, accounting for inflation. Because the HCP covers the entire state, MidAmerican anticipates that five surveys across the state will be needed to evaluate the presence and/or absence of a Covered Species for all Projects within a revised range. Costs to implement this response are estimated to be $100,000.

8.2.1.3 Trigger

MidAmerican discovers an INBA fatality at a Project currently outside the known range for the species in Iowa (see Section 3.2.4).

8.2.1.4 Response

MidAmerican will notify the USFWS within 48 hours of positive identification and continue to implement the HCP including feathering all turbines at the affected Project at wind speeds below the manufacturer's cut-in speed during the bat active period from sunset to sunrise. If the INBA fatality is found at Charles City, Lundgren, Wellsburg or any Project that triggered Adaptive Management Level II (see Section 5.5.1, Table 5.6), MidAmerican will continue feathering all turbines at the Project at wind speeds below 5.0 m/s from July 1 through September 30 from sunset to sunrise. If the INBA fatality occurred at any other Project, MidAmerican will begin feathering all turbines at that Project at wind speeds below 5.0 m/s from July 1 through September 30 from sunset to sunrise. In addition, MidAmerican will coordinate with the USFWS within 21 days of positive species identification to evaluate potential next steps for surveys and minimization measures. At a minimum, MidAmerican will conduct a survey following the current USFWS summer survey protocol during the current or next bat active season, depending on timing of carcass discovery, to further evaluate INBA presence/absence within the Project area where the carcass was discovered. MidAmerican will also update its IEoA model with new species ratio calculations as a result of the discovery, and the new Project if it is outside the current range of INBA in Iowa (see Section 5.5.1).

8.2.1.5 Trigger

The USFWS notifies MidAmerican of a shift in migration patterns in Iowa for one or more of the Covered Bat Species, either in peer-reviewed literature or recorded by or reported to or by the USFWS.

8.2.1.6 Response

MidAmerican and the USFWS will work to evaluate the shift in migration patterns to determine whether a change in timing of the minimization measures specified in Section 5.3.2 (i.e., feathering below manufacturer's cut-in speed and/or feathering turbines below a 5.0 m/s cut-in speed during the curtailed period for a curtailed Project) is necessary. If the evaluation with the USFWS determines that the Covered Bat Species are at risk from the Projects earlier in the spring or later in the fall (during the extended migration period), MidAmerican will extend the period during which turbines are feathered below manufacturer's cut-in speed to cover the extended periods either in the spring and/or in the fall. Information from the monitoring studies collected to date will be used to plot the timing of fatalities. If the timing shift in fatalities suggests that the period of risk to the Covered Bat Species has shifted, the period of time when turbines are feathered below 5.0 m/s will be shifted to cover the period when 75% of the fatalities occur (see Section 5.3.2). Any change in timing of minimization measures will take place during to the next bat active season or sooner.

8.2.2 White-Nose Syndrome Impacts Greatly Reduce Covered Species Populations

It is difficult to predict at this time what the long-term effects of WNS will be for the Covered Bat Species. Should WNS impacts result in substantial reductions in populations (i.e., greater than 80% reduction in the OCRU population) of the Covered Bat Species, the impact of the permitted level of take may be greater than expected. This percent reduction is in line with the Indiana bat population reductions that have been observed in the Northeast Recovery Unit (92%) and the Appalachian Mountain Recovery Unit (62%; USFWS 2017), where WNS impacts have occurred for the longest time. Additionally, Turner et al. (2011) documented a 72% decline in the Northeast U.S. Under this changed circumstance, take from the Covered Activities may be less likely due to lower than expected population levels, but it will still be important for MidAmerican to re-evaluate the impact of the permitted level of take. Therefore, MidAmerican has planned for the event that WNS impacts greatly reduce the local populations of INBAs, NLEBs, LBBAs, and/or TRBAs.

8.2.2.1 Trigger

The USFWS notifies MidAmerican that the population of one or more Covered Bat Species has been reduced by 80% or more as a result of WNS based on peer-reviewed literature or on data recorded by or reported to or by the USFWS.

8.2.2.2 Response

MidAmerican will conduct a population viability analysis [e.g., using the Thogmartin model (Thogmartin 2012)], in coordination with the USFWS, to determine whether the Covered Activities, absent additional action in light of the Changed Circumstance or adaptive management response, would jeopardize the species. Within 60 days of notification that this Changed Circumstance has occurred, MidAmerican will provide a written population viability analysis to the USFWS for discussion and evaluation. The results of the report will be used by MidAmerican to re-evaluate the impacts of the taking. The cumulative take up to the point when the Changed Circumstance was triggered, as measured by compliance monitoring (see Section 5.4), will be used to inform the impacts of the taking analysis. Additionally, the effects of any additional action taken in response to any other Changed Circumstance or adaptive management will be evaluated to determine if any additional minimization measures to reduce take or additional mitigation measures to improve the population would be warranted. MidAmerican intends to determine the best appropriate action to reduce the possibility that the adjusted take estimate would lead to jeopardy for the species. These actions may include, but are not limited to, additional habitat protection, implementation of deterrent technology, or support of WNS remediation efforts. Costs to implement this response are estimated to be approximately $10,000, based on a qualified biological consultant’s experience completing a population viability analysis in coordination with the USFWS, including an in person meeting and production of a two-three page memo reporting the results.

8.2.3 Discovery of a Previously Unknown Covered Bat Species Hibernaculum within 8.0 Kilometers (5.0 Miles) or a Covered Bat Species Maternity Colony within 4.0 Kilometers (2.5 Miles) of a Project

Through the ESA Section 6 grant funding, the State continues to study potential bat maternity roots and hibernacula. It is therefore possible that a previously unknown maternity roost site or hibernaculum could be identified within or near the Permit Area.

8.2.3.1 Trigger

The USFWS notifies MidAmerican of the discovery of a previously unknown Covered Bat Species maternity roost site within 4.0 km of a Project and/or hibernaculum within 8.0 km of a Project.[26]

8.2.3.2 Response

MidAmerican will coordinate with the USFWS to evaluate existing compliance monitoring data to determine MidAmerican's position compared to Authorized Take and whether the Project(s) in the vicinity of the newly discovered maternity roost site and/or hibernaculum exhibit Covered Bat Species fatality rates similar to those at Charles City, Lundgren, Macksburg or Wellsburg exhibited in 2015 and 2016. If, as a result of the discovery, MidAmerican determines that the newly discovered maternity roost site or hibernaculum is located near a Project that exhibits Covered Bat Species facility rates similar to the four curtailed Projects and that cumulative take is on a trajectory to exceed Authorized Take, MidAmerican will implement the corresponding adaptive management measure, including operational measures to further minimize take by curtailment and/or deterrents, conducting cleared-plot fatality monitoring to confirm the take trajectory, and/or amend the ITP. MidAmerican will also reevaluate the assumptions used in calculating mitigation (i.e., the REA model results in Appendix G) to determine whether a mitigation true-up is necessary.

8.2.4 Additional Species Listings or Critical Habitat Designations

As a result of current population declines due primarily to WNS, other bat species may become listed during the term of the ITP. In addition, LBBA and TRBA populations are anticipated to decline as the impacts of WNS are realized throughout Iowa, similar to other bat species populations affected by WNS. Other wildlife species may also become listed as federally threatened or endangered, or critical habitat designated, during the term of the ITP. Therefore, MidAmerican believes listing of a new species that could potentially be taken at the Projects constitutes a foreseeable changed circumstance that warrants consideration in this HCP.

[26] These distances are based on USFWS guidance contained in the NLEB Interim Conference and Planning Guidance (USFWS 2014). MidAmerican conservatively applies the recommended distances for INBA hibernacula and roosts for all Covered Bat Species.

8.2.4.1 Trigger

The USFWS notifies MidAmerican Energy of either a proposed rule to list a species under the ESA, or to designate a candidate for listing under the ESA, that may occur in the Permit Area of any of the Projects but is not a Covered Species and that may be at risk of being taken by the Covered Activities.

8.2.4.2 Response

In the event that a non-covered species that may be affected by Covered Activities becomes listed under the ESA, MidAmerican will comply with the ESA. MidAmerican will coordinate with the USFWS to identify an appropriate course of action to comply with the ESA, which may include preparing a permit amendment (see Section 8.4). The Service and MidAmerican will identify measures necessary to avoid take of, adverse modification of the critical habitat of, and/or appreciably reducing the likelihood of the survival and recovery of the species in the wild the newly-listed species as a result of Covered Activities. MidAmerican will implement these measures unless and until the permit is amended to include such species, or until the Service notifies MidAmerican that such measures are no longer needed to avoid take of, or adverse modification of the critical habitat of, the non-covered species, and/or appreciably reducing the likelihood of the survival and recovery of the species in the wild.

8.2.4.3 Trigger

The USFWS notifies MidAmerican of a proposed rule to list the LBBA or TRBA under the ESA.

8.2.4.4 Response

MidAmerican expects that take rates of LBBA and TRBA will decline proportionate to changes in population. MidAmerican will coordinate with the USFWS to evaluate the then-current population level of the LBBA or TRBA, and the compliance monitoring data collected to date to determine contemporary species composition ratios and gather data necessary for a revised IEoA take assessment. If the evaluation suggests that the revised take rate is not contributing to the decline of the species over and above the other stressors that warrant listing, then MidAmerican will continue to implement the HCP as planned. If the evaluation suggests that the revised take rate would appreciably reduce the likelihood of the survival and recovery of the species in the wild, MidAmerican will implement minimization measures such as turbine curtailment or deployment of bat deterrent technology to reduce the rate of take, and/or apply for a permit amendment. The adjusted level of LBBAs or TRBAs take will use the same take estimation and impact evaluation methods described in Appendix D and Chapter 4 of the HCP or as modified through application of Section 8.2.5.

8.2.5 <u>New Technology and Information</u>

Over the Permit term, new information on the Covered Species and bat or eagle/wind-power interactions is likely to become available, new methods for monitoring and/or estimating mortality are likely to be developed, and new technology may be developed to minimize bat or eagle mortality from wind turbines. MidAmerican may wish to incorporate new information, methods, and/or technology into the operations and monitoring plans outlined in the HCP. For example, it is expected that over time, results of post-construction monitoring (both at the Projects and from other publicly available sources) and research related to bat/wind-power interactions will be useful in determining changes to improve the onsite minimization measures for the Projects. New methods, procedures, or analysis for monitoring studies are likely to be developed during the course of the ITP that provide more accurate results for determining the appropriate management actions for the Projects (e.g., adjusting the turbine operations) to minimize impacts. For example, improvements to the IEoA method using covariate analyses and additional monitoring data from the Projects and other projects in Iowa relevant to the Covered Activities may improve the take estimation method and then further allow targeted measures to minimize take of the Covered Bat Species.

Currently, ongoing studies addressing the influence of weather conditions on bat mortality may inform improved operations of turbines to meet the HCP conservation objectives and increase output of the Projects. Specifically, studies conducted at the Projects in 2015 and 2016, including the simultaneous collection of post-construction monitoring data plus studies about the presence and migration of the Covered Species, may provide insight into the interactions and potential for take of bats at the Projects. The particle tracking study conducted for the Projects in 2016 may also contribute to knowledge beneficial to monitoring wind projects in general.

These and other studies and research on the Covered Species are likely to provide useful information related to location, timing, and characteristics of migration or periods when risk is elevated; such information could inform mortality estimates and effective curtailment conditions for minimizing take at the Projects. Deterrent technologies (e.g., acoustic deterrents, visual deterrents) are also being investigated and new advances may make these technologies effective at avoiding and minimizing take while also improving output at the Projects. Ideally, these types of technological advances and new information will be used to improve the ability to estimate mortality and maximize the effectiveness of the minimization and monitoring measures associated with the Projects and this HCP.

8.2.5.1 Trigger

MidAmerican Energy notifies the USFWS of the intent to utilize alternative monitoring, mortality estimation, or minimization methods. Any new method, information or technology will only be considered if it has been demonstrated to be as effective as or more effective than the methods described in the HCP and has been approved in writing by the USFWS field office administering the HCP and will not require an increase in the take authorization.

8.2.5.2 Response

At least 90 days prior to implementing any new measures for monitoring, estimating mortality, or minimizing take, MidAmerican will meet with the USFWS to inform them of the new methods, how they will be implemented, and any special conditions that may be implemented. MidAmerican will work with the USFWS to ensure that any new information or techniques that are used are compatible with the biological goals and objectives of the HCP. Any changes to the minimization measures will result in at least one year of monitoring and reporting to confirm the effectiveness of the new measures. The monitoring study plan will be determined in consultation with the USFWS. These measures and changes as specified in the Changed Circumstance will be treated as administrative changes to the HCP. Due to the wide array of technological advances and information regarding the covered species that may occur over a 30-year period, a specific cost estimate is not available at this time, but MidAmerican will fund potential costs related to the adoption of new technology or information through existing liquidity sources.

8.2.6 Repowering Projects

MidAmerican Energy is currently repowering up to 706 turbines at seven Projects (see Section 2.2.1.1). It is anticipated that these repowering activities would occur from 2017 through 2020. Over the permit term, it is reasonably foreseeable that repowering turbines at additional Projects will occur as the Projects age and/or technology improves.

Repowering can vary from replacing Project components, such as the blades or nacelles, to completely removing the Project turbines and replacing them with new turbines. Currently it is unknown what repowering additional Projects will consist of (and when it will occur), but it is anticipated that in some cases existing foundations, supporting tower structures, and underground collection systems would remain in place and be re-used, while in other cases new infrastructure and turbines may be needed. The repowering process is expected to be similar to the construction process, though the scope could be limited to building crane stabilization pads and movement corridors, and equipment laydown areas in cases where existing towers and infrastructure will remain in place.

8.2.6.1 Trigger

MidAmerican Energy notifies the USFWS of the intent to repower one or more additional Projects other than those addressed in Section 2.2.1.1.

8.2.6.2 Response

At least 90 days prior to beginning the repowering process for any additional Project, MidAmerican will notify the USFWS of the intent to repower a Project and submit a repowering plan that will include, but not be limited to, a description of the repowering process for that Project, the anticipated life of the repowered Project, an evaluation of potential impacts to the Covered Species that could arise from repowering, and an associated take assessment for the Covered Species, which revised assessment will also be informed by the results of monitoring to date. The objective of the evaluation is to determine whether impacts from potential take at the repowered Project would change from the existing assessment included in the HCP. Because the details of repowering are unknown at this time, an evaluation will be made for each Project at the time of repowering to determine if impacts of take are less than, equal to, or greater than the impacts described in the HCP. Once the impact evaluation is complete, MidAmerican will coordinate with the USFWS to confirm the evaluation’s conclusions and determine appropriate next steps and adjustments to the HCP’s conservation plan, if needed.

In the event that the repowering evaluation determines that potential impacts are less than or equal to the take assessment in the HCP, no changes to the conservation plan will be made and the HCP will continue to be implemented as planned. In the event that impacts at a given Project could be greater than what was contemplated in the HCP, the change in potential impacts to the Covered Species will also account for the results of monitoring to date across all Projects and evaluated against the ITP take limit to determine if adjustments to the conservation plan are needed to maintain compliance with the ITP after repowering. Adjustments could include, but are not limited to, implementing curtailment at the repowered Project(s), deploying bat deterrent technology, and/or seeking a permit amendment. MidAmerican will also reevaluate the assumptions used in calculating mitigation (i.e., the REA model results in Appendix G) to determine whether a mitigation true-up is necessary. Any changes to the minimization measures will result in at least one year of monitoring and reporting to confirm the effectiveness of the new measures. The monitoring study plan will be developed in coordination with the USFWS.

8.2.7 Natural Disasters Affecting Mitigation Lands

A range of natural phenomena, such as tornadoes, drought, wildfire, floods, or newly invasive species, are reasonably expected to occur over the Permit term and may impact mitigation lands. It is reasonable to expect some natural disasters affecting mitigation projects to occur during the 30-year Permit term, although based on the location of the mitigation projects in Iowa, these events are not expected to occur with regularity and the likelihood of catastrophic events, such as wildfire, that may completely destroy a mitigation site is low. MidAmerican's mitigation program is designed to deliver benefits to the Covered Species at a landscape-scale across the state of Iowa. Because mitigation lands will not be concentrated in one single area, the likelihood that any single natural disaster event would significantly impact MidAmerican's mitigation program is reduced. Based on the infrequent occurrence of natural disasters in Iowa, the low likelihood of catastrophic natural disasters, and the distribution of mitigation sites across the State, MidAmerican anticipates that up to 10% of the mitigation implemented throughout Iowa during the 30-year Permit term may be adversely affected by natural disaster. The distributed nature of the anticipated mitigation sites across the Iowa landscape means it is unlikely that all mitigation lands would be affected simultaneously and/or by the same natural disaster. Accordingly, MidAmerican has calculated that approximately $379,600 may be necessary to address impacts from natural disasters on mitigation lands. MidAmerican has evaluated the probability of potential natural disasters impacting mitigation lands. Based on this evaluation, it is estimated that the probability of all natural disasters combined affecting more than 61.1 acres is less than 1% over 30 years. Using the mitigation lands management fee of approximately $2,900/acre (see Section 6.3) would result in the need for approximately $177,190 to restore mitigations lands following a natural disaster. The remaining $202,410 would be reserved as a changed circumstances contingency fund. This amount, if triggered, will be available from MidAmerican's credit facility as described in Section 6. If, at the time this changed circumstance is triggered, MidAmerican's credit rating has dropped sufficient to trigger the need to post a letter of credit (see Section 6.2), MidAmerican will post a separate $379,600 letter of credit to implement actions identified in Section 8.2.7.

8.2.7.1 Drought

Drought is a deficiency in precipitation over an extended period of time. It is a normal, recurrent feature of climate that occurs in nearly all climate zones. Drought may develop quickly due to extreme heat and/or wind or more gradually due to more subtle climate changes that persist over a long period of time. The duration of droughts varies widely and may last for a relatively short period of time or span multiple years (NWS 2012).

A study of historic climate patterns in Iowa based on tree ring indices from 1642 – 1982 concluded that prolonged periods of droughts, such as a decade like the 1930s, occur about twice per century in Iowa (Cleaveland and Duvick 1992). Since 2000, the longest duration of drought (D1-D4) in Iowa lasted 151 weeks beginning in August 2010 and ending in June 2014. The most intense period of drought occurred the week of November 6, 2012, where D4 affected 2.52% of Iowa. The statewide probability of future droughts in Iowa in the order of magnitude qualifying as a severe drought event is between 10% and 19% in any given year (Iowa Homeland Security and Emergency Management [IHSEM] 2013).

Although droughts often cause increased tree mortality and can result in increases in snag density, which may improve roosting habitat available to bats, severe or prolonged droughts can cause extreme tree mortality and result in unsuitable habitat for the Covered Species.

8.2.7.1.1 Trigger

Negative impacts of drought on a habitat mitigation project would trigger corrective action if during or immediately following (same season) an Extreme (D3) to Exceptional (D4) drought (as determined by the U.S. Drought Monitor [http://www.droughtmonitor.unl.edu/ monitor.html]) causes the mitigation metrics (e.g., tree density, snag size-class density metrics, understory composition, etc.) to drop more than 25% below the target values.

8.2.7.1.2 Response

Within one year of the end of a drought triggering corrective action, one or more of the following restoration actions will be taken, depending on the mitigation metric(s) affected by the drought. Tree planting will occur in areas where the tree density is greater than 25% below the mitigation metric target value. Tree girdling will occur in areas where the snag density is greater than 25% below the mitigation metric target value (this will be done on a size-class specific basis). Non-native woody invasive species will be controlled in areas where the native understory composition is greater than 25% below the mitigation metric target value.

Effective restoration actions cannot be implemented until after the drought is over. Prolonged drought lasting beyond the 30-year ITP Term is not anticipated and would be an unforeseen circumstance. Additionally, Extreme (D3) or Exceptional (D4) intensity droughts occurring during more than 20% of the 30-year ITP Term are not expected and would also be an unforeseen circumstances based on the historic and projected patterns of droughts in Iowa (IHSEM 2013). Response actions for unforeseen circumstances will be consistent with existing ITP obligations.

8.2.7.2 Grass or Forest Fire

Fire is a naturally occurring component of most ecosystems although the frequency and severity of fire regimes varies greatly. In the Midwest, historical fire regimes differed based on land cover: forested areas were ruled by low severity or mixed severity fires occurring with a zero to 35-year frequency while the prairie plains were ruled by stand replacement severity fires occurring with a zero to 35 year frequency (FFS 2000a). Fire regimes in most areas of Iowa consisted of stand replacement severity fires that occurred with a zero to 35-year frequency. In northeastern and central portions of the state, the historical fire regime was dominated by low severity fires that occurred with zero to 35-year frequency. Small areas of historical mixed severity, 35 to more than 100-year frequency fire regimes are also scattered across the state. Currently, most of Iowa is classified as agricultural and non-vegetated areas (FFS 2000b). The fragments of forested or grassland habitat in the state are mostly classified as having fire regimes that have been moderately to significantly altered from their historical range. These classifications (Condition Class 2 and 3) indicate that fire frequencies have departed from historical frequencies and landscape patterns and vegetation attributes have been altered from their historical range. Consequently, there is a moderate to high risk of losing key ecosystem components in these areas and fire size, intensity, and severity patterns have changed (Schmidt et al. 2002).

There have been 1,817 wildfires spanning 33,122 acres from 2002 until 2012 in Iowa (IHSEM 2013). No event reported during that time period was a historically significant wildfire. The probability of a wildfire in any given year is considered occasional (10-19%) due to the number of fires reported and the infrequency of historically significant wildland fires as determined and maintained by the National Interagency Fire Center (none are on record since the first recorded event in 1804). Lightning strikes or other natural causes account for very few wildfires in Iowa, as the majority of fires are caused by humans (FFS 1999). Drought conditions have the potential to increase the frequency and severity of wildfires.

Although wildfires often cause increased tree mortality and can result in increases in snag density, which may improve roosting habitat available to bats, severe wildfires can cause extreme tree mortality and result in unsuitable habitat for the Covered Species.

8.2.7.2.1 Trigger

A wildfire that physically impacts a habitat mitigation project would trigger corrective action if immediately following (same season) the wildfire, the mitigation metrics (e.g., tree density, snag size-class density metrics, understory composition, etc.) are greater than 25% below the target values.

8.2.7.2.2 Response

Within one year of the end of a wildfire triggering corrective action, one or more of the following restoration actions will be taken, depending on the mitigation metric(s) affected by the wildfire. Tree planting will occur in areas where the tree density is greater than 25% below the mitigation metric target value. Tree girdling will occur in areas where the snag density is greater than 25% below the mitigation metric target value (this will be done on a size-class specific basis). Non-native woody invasive species will be controlled in areas where the native understory composition is greater than 25% below the mitigation metric target value.

Fires determined to be caused by arson are not anticipated and would be an unforeseen circumstance. Additionally, based on the historic pattern of wildfire frequency and severity in Iowa (FFS 2000a), more than one wildfire triggering corrective action during the 30-year ITP Term is not anticipated and would be an unforeseen circumstance.

8.2.7.3 Floods

Flooding is a recurrent disturbance in Iowa, particularly during the spring and summer months (Gillles et al. 2012). Flood conditions caused by intense rainfall events are exacerbated by the predominance of row crops on the landscape, which increases peak stream flows (Gilles et al. 2012). The events can occur in the form of flash floods and river flooding in Iowa.

Flash flood waters move quickly and can move boulders, tear out trees, and scour channels (IHSEM 2013). It is considered likely that a flash flood will affect Iowa in any given year (IHSEM 2013). Between 1996 and 2012, Iowa experienced 634 flash flooding events for an average of 39 events per year over that time period. The National Climatic Data Center (NCDC) of the National Oceanic and Atmospheric Administration (NOAA) maintains a database of all storm events, including flooding, by county.

Flooding is an annual event and typically occurs along specific streams, rivers, and watersheds. It is considered highly likely that river flooding with affect Iowa in any given year (IHSEM 2013). Between 1953 and 2013, Iowa has had 36 major disasters related to flooding, some of which affected the majority of the state's counties (IHSEM 2013).

8.2.7.3.1 Trigger

Negative impacts of flooding on a habitat mitigation project would trigger corrective action if immediately following (same season) a flood the mitigation metrics (e.g., tree density, snag size-class density metrics, understory composition, etc.) are greater than 25% below the target values.

8.2.7.3.2 Response

Within one year of the end of a flood event triggering corrective action, one or more of the following restoration actions will be taken, depending on the mitigation metric(s) affected by the flooding. Tree planting will occur in areas where the tree density is greater than 25% below the mitigation metric target value. Tree girdling will occur in areas where the snag density is greater than 25% below the mitigation metric target value (this will be done on a size-class specific basis). Non-native woody invasive species will be controlled in areas where the native understory composition is greater than 25% below the mitigation metric target value.

8.2.7.4 Tornadoes and Windstorms

Tornadoes are a frequent severe weather event throughout Iowa (IHSEM 2013). Tornadoes are more likely to occur in the late afternoon in the spring and summer months. However, tornadoes may occur at any time. Between 2000 and 2013 there were 224 tornadoes in Iowa, averaging more than 17 tornadoes per year. Between 1968 and 2013, Iowa experienced 11 federally declared tornado disasters. The NCDC includes tornadoes in its database of all storm events by county.

8.2.7.4.1 Trigger

A tornado that physically impacts a habitat mitigation project would trigger corrective action if immediately following (same season) a tornado, the mitigation metrics (e.g., tree density, snag size-class density metrics, understory composition, etc.) are greater than 25% below the target values.

8.2.7.4.2 Response

Within one year of the end of a tornado triggering corrective action, one or more of the following restoration actions will be taken, depending on the mitigation metric(s) affected by the tornado. Tree planting will occur in areas where the tree density is greater than 25% below the mitigation metric target value. Tree girdling will occur in areas where the snag density is greater than 25% below the mitigation metric target value (this will be done on a size-class specific basis). Non-native woody invasive species will be controlled in areas where the native understory composition is greater than 25% below the mitigation metric target value.

Based on the historic pattern of tornadoes in Iowa, more than seven tornados triggering corrective action during the 30-year ITP Term is not anticipated and would be an unforeseen circumstance. Response actions for such unforeseen circumstances will be consistent with ITP obligations.

8.3 Unforeseen Circumstances

Unforeseen Circumstances are defined as changes in circumstances affecting a species or geographic area covered by a conservation plan that could not reasonably have been anticipated by plan developers and the USFWS at the time of the negotiation and development of the plan and that result in a substantial and adverse change in the status of the Covered Species (50 C.F.R. § 17.3).

The USFWS bears the burden of demonstrating that Unforeseen Circumstances exist using the best available scientific and commercial data available while considering certain factors (50 C.F.R. §§ 17.22(b)(5)(iii)(C)) and 17.32(b)(5)(iii)(C)). In deciding whether Unforeseen Circumstances exist, the USFWS will consider, but not be limited to, the following factors (50 C.F.R. §§ 17.22(b)(5)(iii)(C)):

1. The size of the current range of the affected species,

2. The percentage of the range adversely affected by the covered activities,

3. The percentage of the range that has been conserved by the HCP,

4. The ecological significance of that portion of the range affected by the HCP,

5. The level of knowledge about the affected species and the degree of specificity of the conservation program for that species under the HCP, and

6. Whether failure to adopt additional conservation measures would appreciably reduce the likelihood of survival and recovery of the species in the wild.

When negotiating Unforeseen Circumstances, the USFWS will not require the commitment of additional land, water, or financial compensation or additional restrictions on the use of land, water, or other natural resources beyond the level otherwise agreed upon for the species covered by the HCP without the consent of the permittee (50 C.F.R. §§ 17.22(b)(5)(iii)(A)). If additional conservation and mitigation measures are deemed necessary to respond to Unforeseen Circumstances, the USFWS may require additional measures of the permittee where the HCP is being properly implemented only if such measures are limited to modifications within conserved habitat areas, if any, or to the HCP's operating conservation program for the affected species, and maintain the original terms of the plan to the maximum extent possible (50 C.F.R. § 17.22(b)(5)(iii)(B)).

Notwithstanding these assurances, nothing in the No Surprises Rule will be construed to limit or constrain the USFWS, any federal agency, or a private entity, from taking additional actions, at its own expense, to protect or conserve a species included in a conservation plan.

8.4 Amendments

The HCP and/or ITP may be modified in accordance with the ESA, the USFWS' implementing regulations and this section. HCP and permit modifications are not anticipated on a regular basis; however, modifications to the HCP and/or ITP may be requested by either MidAmerican or the USFWS. The USFWS also may amend the ITP at any time for just cause, and upon a written finding of necessity, during the Permit term in accordance with 50 C.F.R. § 13.23(b). The categories of modifications are administrative changes, minor amendments, and major amendments.

The HCP Handbook (USFWS and NMFS 2016) indicates that an ITP should be amended when the permittee significantly modifies the covered activities, the Project, or the conservation plan as described in the original HCP. Such modifications may include changes in the Project area, changes in funding, addition of species to the ITP that were not addressed in the original HCP, or adjustments to the HCP due to changes in strategies developed to address Changed or Unforeseen Circumstances.

8.4.1 Administrative Changes

Administrative changes are internal changes or corrections to the HCP that may be made by MidAmerican Energy, at its own initiative, or approved by MidAmerican in response to a written request submitted by the USFWS. Requests from the USFWS will include an explanation of the reason for the change, as well as any supporting documentation. Administrative changes on MidAmerican's initiative do not require preauthorization or concurrence from the USFWS. MidAmerican will provide notice, in writing, to USFWS within seven days of any administrative change.

Administrative changes are those that will not: (a) result in effects to a Covered Species that are new or different than those analyzed in the HCP, NEPA EIS, or the USFWS BO; (b) result in take beyond that authorized by the ITP; (c) negatively alter the effectiveness of the HCP; or (d) have consequences to aspects of the human environment that have not been evaluated. MidAmerican will document each administrative change in writing and provide the USFWS with a summary of all changes, as part of its annual report, along with any replacement pages, maps, and other relevant documents for insertion in the revised document.
Administrative changes include, but are not limited to, the following:

- Corrections of typographical, grammatical, and similar editing errors that do not change intended meanings;

- Corrections of any maps or exhibits to correct minor errors in mapping; and

- Corrections of any maps, tables, or appendices in the HCP to reflect approved amendments, as provided below, to the HCP or ITP.

8.4.2 <u>Minor Amendments</u>

Minor amendments are changes to the HCP the effects of which on Covered Species, the conservation strategy, and MidAmerican's ability to achieve the biological goals and objectives of the HCP are either beneficial or neutral/equivalent. Such amendments will not increase impacts to species, their habitats, and the environment beyond those analyzed in the HCP, EIS, and BO or increase the levels of take beyond that authorized by the ITP.

Minor amendments to the HCP may also require an amendment to the ITP. A proposed minor amendment must be approved in writing by the USFWS and MidAmerican before it may be implemented. A proposed minor amendment will become effective on the date of the joint written approval.

MidAmerican Energy or the USFWS may propose minor amendments by providing written notice to the other party. The party responding to the proposed minor amendment should respond within 30 days of receiving notice of such a proposed modification. Such notice shall satisfy the provisions of 50 C.F.R. § 13.23, as well as include a description of the proposed minor amendment; the reasons for the proposed amendment; an analysis of the environmental effects, if any, from the proposed amendment, including the effects on and an assessment of the amount of take of the Covered Species; an explanation of the reason(s) the effects of the proposed amendment conform to and are not different from those described in this HCP; and any other information required by law. When MidAmerican proposes a minor amendment to the HCP, the USFWS may approve or disapprove such amendment, or recommend that the amendment be processed as a major amendment as provided below. The USFWS will provide MidAmerican with a written explanation for its decision. When the USFWS proposes a minor amendment to the HCP, MidAmerican may agree to adopt such amendment or choose not to adopt the amendment. MidAmerican will provide the USFWS with a written explanation for its decision. The USFWS retains its authority to amend the ITP, however, consistent with 50 C.F.R. § 13.23.

Provided a proposed amendment is consistent in all respects with the criteria above, minor amendments include, but are not limited to, the following:

- Updates to incorporate the most current land cover map or Covered Species occurrence data published by the USFWS;
- Decreasing the scope of the covered lands in the HCP (e.g., if MidAmerican no longer owns or operates a Project(s));
- Modification of monitoring protocols for HCP effectiveness not in response to changes in standardized monitoring protocols from the USFWS;
- Modification of existing, or adoption of new, incidental take avoidance measures;
- Modification of existing, or adoption of additional, minimization and mitigation measures that improve the likelihood of achieving HCP goals and objectives;
- Modification of existing or adoption of new performance indicators or standards if results of monitoring and research, or new information developed by others, indicate that the initial performance indicators or standards are inappropriate measures of success of the applicable conservation measures;
- Modification of existing or the adoption of additional habitat objectives for the Covered Species, where such changes are consistent with achieving HCP goals and objectives;
- Minor changes to survey or monitoring protocols that are not proposed in response to adaptive management and that do not adversely affect the data gathered from those surveys;
- Day-to-day Project implementation decisions, such as maintenance of erosion and sediment control devices;
- Conducting monitoring surveys in addition to those required by the HCP and ITP;
- Modifying HCP monitoring protocols to align with any future modifications to the protocols by the USFWS;
- Adopting new monitoring protocols that may be promulgated by the USFWS in the future; and
- Minor changes to the reporting protocol.

8.4.3 Major Amendments

A major amendment is any proposed change or modification that does not satisfy the criteria for an administrative change or minor amendment. Major amendments to the HCP and ITP are required if MidAmerican desires, among other things, to modify the Projects and Covered Activities described in the HCP such that they may affect the impact and take analyses or conservation strategy of the HCP, affect other environmental resources or other aspects of the human environment in a manner not already analyzed, or result in a change for which public review is required. Major amendments must comply with applicable permitting requirements, including Section 7 of the ESA.

In addition to the provisions of 50 C.F.R. § 13.23(b), which authorize the USFWS to amend an ITP at any time for just cause and upon a finding of necessity during the Permit term, the HCP and ITP may be modified by a major amendment upon MidAmerican's submission of a formal permit amendment application and the required application fee to the USFWS, which will be processed in the same manner as the original permit application. Such application generally will require submittal of a revised HCP, and preparation of an environmental review document in accordance with NEPA. The specific document requirements for the application may vary, however, based on the substance of the amendment. For instance, if the amendment involves an action that was not addressed in the original HCP, or NEPA analysis, the documents may need to be revised or new versions prepared addressing the proposed amendment. If circumstances necessitating the amendment were adequately addressed in the original documents, an amendment of the ITP might be all that would be required.

Upon submission of a complete application package, the USFWS will publish a notice of the receipt of the application in the Federal Register, initiating the NEPA and HCP Amendment public comment process. After the close of the public comment period, the USFWS may approve or deny the proposed amendment application. MidAmerican may, in its sole discretion, reject any major amendment proposed by the USFWS.

Changes that would require a major amendment to the HCP or ITP include, but are not limited to:

- Revisions to the covered lands or activities that do not qualify as a minor amendment;
- Addition of a new Covered Species that is not analyzed in the HCP or NEPA document and is likely to be taken by the Covered Activities; or
- A renewal or extension of the Permit term beyond the original term of the ITP, where the criteria for a major amendment are otherwise met, and where such request for renewal is in accordance with 50 C.F.R. § 13.22.

8.4.4 Changes Due to Adaptive Management or Changed Circumstances

Unless explicitly provided in Section 5.5 (*Adaptive Management for Take Compliance*) and Section 8.2 (*Changed Circumstances*) of this HCP, the need for and type of amendment to deal with Adaptive Management or Changed Circumstances will be determined by the Service, in coordination with MidAmerican, at the time such responses are triggered. In general, any changes in the HCP or ITP needed to implement an Adaptive Management or Changed Circumstances response are expected to qualify as Minor Amendments to the HCP or ITP. However, a change to an Adaptive Management or Changed Circumstances provision itself likely would constitute a Major Amendment.

8.5 Permit Renewal

MidAmerican requests that the ITP associated with this HCP be renewable pursuant to 50 C.F.R. § 13.22. If MidAmerican plans to continue to operate the Projects after the Permit term and the cumulative take documented for the Project is less than the take level authorized in the ITP, then MidAmerican will file in writing a renewal request at least thirty (30) days prior to the permit expiration. The renewal request will:

- Be in writing;
- Reference the permit number;
- Certify that all statements and information in the original application are still correct or include a list of changes;
- Provide specific information concerning what take has occurred under the existing permit and what portions of the Projects are still to be completed; and
- Request renewal.

Any changes to the renewed permit will be conducted the same as administrative changes and permit amendments.

8.6 Financial Commitments

8.6.1 Expenditure of Funds

MidAmerican Energy warrants that it has, and shall expend, such funds as may be necessary to fulfill its obligations under the ITP and the HCP. MidAmerican shall notify the Service within seven days of any material change in MidAmerican's financial ability to fulfill its obligations under the HCP and the ITP.

The total estimated One Time costs and annual costs; applicable funding sources; and applicable funding assurance mechanisms are provided in Table 8.1.

Table 8.1 HCP Implementation and Funding Estimates

HCP Obligation	Estimated One Time Cost	Estimated Annual Cost	Funding Source	Funding Assurance Mechanism 1	Funding Assurance Mechanism 2	Funding Assurance Mechanism 3
Plan Administration, Monitoring, Reporting (§ 6.1)		$1,060,000	Sources of liquidity and/or credit facility	Self-bonding with Indemnity Agreement	Letter of credit if self-bonding credit rating criteria are no longer met	
Training Materials(§ 6.1)	$15,000		Sources of liquidity and/or credit facility	Self-bonding with Indemnity Agreement		
Bat Mitigation (§ 6.3)	$4,347,000		Sources of liquidity and/or credit facility	Self-bonding with Indemnity agreement	Funds Deposited into Escrow upon ITP Issuance	
Bat Mitigation Lands Management (§ 6.3)	$3,796,100		Sources of liquidity and/or credit facility	Self-bonding with Indemnity agreement	Funds Deposited into Escrow upon ITP Issuance	
Eagle Mitigation (§ 6.3)	$1,602,000		Sources of liquidity and/or credit facility	Self-bonding with Indemnity agreement	Funds Deposited into Escrow upon ITP Issuance	
Adaptive Management (Bat Mitigation) (§ 6.3)	$5,673,000		Sources of liquidity and/or credit facility	Self-bonding with Indemnity agreement	Funds Deposited into Escrow, if triggered	Letter of credit if self-bonding credit rating criteria are no longer met
Adaptive Management (Bat Mitigation Lands Management) (§ 6.3)	$5,483,900		Sources of liquidity and/or credit facility	Self-bonding with Indemnity agreement	Funds Deposited into Escrow, if triggered	Letter of credit if self-bonding credit rating criteria are no longer met
Adaptive Management (Eagles) (§ 6.1)	$796,000		Sources of liquidity and/or credit facility	Self-bonding with Indemnity agreement	Letter of credit if self-bonding credit rating criteria are no longer met	
Changed Circumstances/Contingency Fund (§ 6.1)	$494,610		Sources of liquidity and/or credit facility	Self-bonding with Indemnity agreement	Letter of credit if self-bonding credit rating criteria are no longer met	

HCP Obligation	Estimated One Time Cost	Estimated Annual Cost	Funding Source	Funding Assurance Mechanism 1	Funding Assurance Mechanism 2	Funding Assurance Mechanism 3
Total One Time Costs*	**$22,207,610**					
Total Annual Costs x 30 year Permit Term		**$31,800,000**				
Grand Total Estimated HCP Implementation Costs*	**$54,007,610**					

***Note: The estimated totals includes total One Time cost tabulations for adaptive management and changed circumstances responses that may not be triggered over the permit term.**

8.6.2 Refunds and Injunctive Relief

If a legal challenge to the final ITP is brought by any third party and the challenge results in the entry of preliminary or permanent injunctive relief that precludes operation of any or all of the Projects according to the ITP's and HCP's terms, expenditures of money from the Conservation Fund may be stayed until the final resolution of such legal challenges, including any administrative or judicial appeals by any party. Upon exhaustion of appeals to such challenges, money in the Conservation Fund may be spent and obligated so long as the ITP is not terminated, relinquished, or revoked.

In the event the ITP is terminated, relinquished, or revoked prior to the expenditure of all money from the conservation fund, then the balance of all unspent and unobligated money shall promptly be refunded to MidAmerican so long as mitigation has been completed for the amount of take at the point of termination, relinquishment or revocation. Upon such an event, MidAmerican will notify both the third-party fund administrator and the Service, and the third-party fund administrator shall promptly refund all unspent and unobligated money to MidAmerican.

8.7 MidAmerican Energy Company's Property Rights

The Parties agree that MidAmerican has entered into the ITP and the HCP on a voluntary basis. Except as otherwise specifically provided herein, nothing in the HCP or ITP shall be deemed to restrict the rights of MidAmerican to operate the Projects, or use or develop the Permit Area, provided that nothing in the HCP or ITP shall absolve MidAmerican from such other limitations as may apply to such activities, lands, or interests in land, under the ESA or other laws, of the United States, and the laws of the State.

The Parties recognize that Covered Activities may provide multiple benefits beyond conservation of Covered Species, including, but not limited to, renewable energy benefits, pollution benefits, tax benefits, environmental benefits, carbon benefits, clean water benefits, and open space benefits ("Additional Benefits"). Nothing in the HCP or ITP is intended to limit MidAmerican's rights to participate in any program or enter into any agreement to recognize the full financial value of these Additional Benefits, provided that MidAmerican complies with the HCP and ITP.

The terms hereof are not intended to run with the land and will not bind the existing owners of Covered Lands or subsequent purchasers of the Projects or Permit Area unless such Parties agree in writing to become bound by the HCP and the ITP. Such Parties that are not bound by the ITP shall not benefit from the Service's authorization of incidental take coverage or assurances.

8.8 Remedies and Liability

Except as set forth below, each Party shall have all remedies otherwise available (including specific performance and injunctive relief) to enforce the terms of the ITP and the HCP. Nothing contained in the ITP is intended to limit the authority of the United States government to seek civil or criminal penalties or otherwise fulfill its enforcement responsibilities under the ESA or other applicable law.

No Party shall be liable in damages under the ESA to any other Party for any breach of the HCP or ITP, any performance or failure to perform a mandatory or discretionary obligation imposed by the HCP or ITP, or any other cause of action arising from the HCP or ITP.

8.9 Dispute Resolution

The Parties recognize that good faith disputes concerning implementation of, or compliance with, or suspension, revocation or termination of the HCP or the ITP may arise from time to time. The Parties agree to work together in good faith to resolve such disputes, using the dispute resolution procedures set forth in this Paragraph or such other procedures upon which the Parties may later agree. However, if at any time any Party determines that circumstances so warrant, it may seek any available remedy without waiting to complete dispute resolution.

If the Service has reason to believe that MidAmerican may have violated the ITP with respect to any Covered Species, it will notify MidAmerican in writing of the specific provisions which may have been violated, the reasons the Service believes MidAmerican may have violated them, and the remedy the Service proposes to impose to correct or compensate for the alleged violation. MidAmerican will then have sixty (60) days, or such longer time as may be mutually acceptable, to respond. If any issues cannot be resolved within thirty (30) days, or such longer time as may be mutually acceptable, after MidAmerican's response is due, the Parties will consider non-binding mediation and other alternative dispute resolution processes.

The Parties reserve the right, at any time without completing informal dispute resolution, to use whatever enforcement powers and remedies are available by law or regulation, including but not limited to, in the case of the Service, suspension or revocation of the ITP and civil or criminal penalties

8.10 References to Regulations

Any reference in the HCP or the ITP to any regulation or rule of the Service shall be deemed to be a reference to such regulation or rule in existence at the time an action is taken, except that MidAmerican may rely on the substantive provisions of the HCP to demonstrate compliance with the ESA, consistent with the No Surprises Rule.

8.11 Permit Assignment and Transfer

Assignment or other transfer of the ITP shall be governed by the federal regulations located at 50 C.F.R. Part 13. In accordance with 50 C.F.R. § 13.25, the Parties agree that the ITP may be transferred in whole or in part to a new party through a joint submission by MidAmerican and the new party to the Service field office responsible for administering the ITP describing: (1) each party's role and responsibility in implementing the HCP, (2) each party's role in funding the implementation of the HCP, and (3) any proposed changes to the HCP reasonably necessary to effectuate the transfer and implement the ITP.

The Service may approve a proposed transfer of the ITP in whole or in part to a new party, which approval shall not be unreasonably withheld or delayed, provided that the Service field office responsible for administering the ITP determines that the proposed transferee meets the certification requirements of 50 C.F.R. § 13.25 by: (1) meeting all of the qualifications to hold an ITP under 50 C.F.R. § 13.21; (2) providing adequate written assurances that it will provide sufficient funding for the HCP, and that the proposed transferee will implement the terms and conditions of the ITP, including any outstanding minimization or mitigation requirements; and (3) the proposed transferee has provided such other information that the Service determines is relevant to the processing of the submission. No new conditions will be added to the HCP or the ITP by the Service if the proposed transferee meets these conditions for transfer.

8.12 Reporting and Inspections

8.12.1.1 Reporting and Annual Meeting

MidAmerican Energy will provide the Service with the reports described in Sections 5.4 and 5.6 of the HCP at the notice address then in effect for the Service, and will provide any available information reasonably requested by the Service to verify the information contained in such reports. MidAmerican Energy will provide the Service, within 30 calendar days, any additional information requested to determine whether MidAmerican is in compliance with the ITP and HCP.

MidAmerican Energy and the Service shall conduct annual meetings during the month of April commencing the first April after the ITP is issued to discuss the results of HCP implementation and monitoring, and selection of mitigation projects under the HCP. Nothing in the ITP or HCP shall prevent the Parties from meeting more frequently.

8.12.1.2 Inspections

The Service may inspect the Permit Area in accordance with its applicable regulations and law. Except where the Service has reason to believe that MidAmerican may be acting in violation of applicable laws or regulations or in breach of the ITP, the Service will provide reasonable advance notice (which in no case shall be less than two business days) of its inspection. For any inspection, the Service will adhere to MidAmerican's security procedures, which require representatives of the Company to escort the Service's representatives making such inspection. The Parties agree that it would be an unreasonable time for inspection in the event that there are unsafe work conditions or if a cyber or physical security response plan has been implemented pursuant to requirements of a regulatory agency with jurisdiction over MidAmerican.

If an inspection is interrupted or refused by MidAmerican, the company will reschedule the inspection at the earliest possible date. The Service shall ensure that any individual conducting an inspection of any Project on its behalf performs such inspection in compliance with all regulations and statutes applicable to USFWS and the requirement of this section for advance notice, where applicable. Any representative of the Service inspecting any Project shall use reasonable efforts to promptly brief MidAmerican on the information learned during any such inspection. For the purpose of this paragraph, the Service is intended to mean agency employees, contractors and law enforcement agents.

8.13 Notices under the Habitat Conservation Plan and Incidental Take Permit

8.13.1.1 Required Notices by MidAmerican Energy Company

MidAmerican shall notify the Service in writing within 10 days of the occurrence of any of the following: (1) any change in the registered name of MidAmerican; (2) the dissolution of MidAmerican; (3) the sale or conveyance of MidAmerican or any of the Projects; (4) bankruptcy proceedings by MidAmerican as well as whether MidAmerican is in receivership; (5) when MidAmerican will no longer perform the Covered Activities in the Permit Area; (6) the revocation or suspension of MidAmerican's corporate authorization to do business in the state or states in which it is registered to do business; and (7) MidAmerican is disqualified from performing Covered Activities under the ITP for either of the disqualifying factors circumstances listed in 50 C.F.R. § 13.21(c) and (d), as may be amended, or under any future Service regulation.

8.13.1.2 Required Notices by USFWS

The USFWS shall promptly notify MidAmerican if: (1) for any reason (court ruling or lack of appropriated funds), the Service is unable to fulfill any obligation associated with the HCP or ITP; or (2) any lawsuits filed against the Service pertaining to the ITP or HCP, requests for disclosures of documents received under the Freedom of Information Act pertaining to the ITP or HCP, or written notices or letters expressing an intent to file suit against the Service challenging the issuance of, or MidAmerican's compliance with, the ITP or any federal law relating to the ITP.

8.14 Revocation and Relinquishment

8.14.1 Permit Revocation and Suspension

The ITP may be revoked by the Service only in accordance with 50 C.F.R. §§ 13.28, 17.22(b)(8) and 17.32(b)(8). In accordance with 50 C.F.R. § 13.28, the Service may revoke the ITP in whole or in part if MidAmerican willfully violates any federal or state statute or regulation, Indian tribal law or regulation, or any law or regulation of a foreign country that involves a violation of the conditions of the ITP or of the laws or regulations governing the Covered Activities. The ITP also may be revoked if MidAmerican fails, within 60 days, to correct deficiencies that were the cause of suspension of the ITP; unless the Service determines and notifies MidAmerican in writing that a longer period of time is necessary to correct the deficiencies, or MidAmerican becomes disqualified under 50 C.F.R. § 13.21(c), or because a change occurs in the statute or regulation authorizing the ITP that prohibits continuation of the ITP. Pursuant to 50 C.F.R. §§17.22(b)(8) and 17.32(b)(8), the ITP also may be revoked if continuation of the Covered Activities would be inconsistent with the criterion set forth in 16 U.S.C. § 1539(a)(2)(B)(iv) and the inconsistency has not been remedied.

When the Service believes there are valid grounds for revoking the ITP, it will notify MidAmerican in writing of the proposed revocation by certified or registered mail. The notice, which may be amended by the Service at any time, will identify the ITP, whether the revocation is as to part or all of the ITP, the Covered Activities and Covered Species as to which the revocation applies, the reason(s) for the revocation, and the proposed disposition of the wildlife, if any. The notice also shall inform MidAmerican of its right to object to the proposed revocation. Upon receipt of the proposed notice, MidAmerican may file a written objection to the proposed action within 45 calendar days of the date of the notice providing its reasons for objecting to the proposed revocation as well as any supporting documentation.

The Service will issue a written decision on the revocation within 45 days after the end of the objection period. The written decision will include the Service's decision and its reasons for such, as well as information concerning MidAmerican's right to request reconsideration of the decision under 50 C.F.R. § 13.29 and the procedures for doing so. Upon notification that the ITP has been revoked and after all appeal procedures have been exhausted, MidAmerican may be required to surrender the ITP to the Service.

The Service may suspend the ITP, in whole or in part, in accordance with its regulations located at 50 C.F.R. § 13.27. The procedures for requesting reconsideration of the Service's decision to suspend an ITP are located at 50 C.F.R. § 13.29.

8.14.2 Relinquishment

MidAmerican Energy reserves the right to relinquish the ITP prior to expiration by providing thirty (30) days advance written notice to the Service as provided by 50 C.F.R. § 13.24. The ITP shall be deemed canceled only upon a determination by the Service that any outstanding monitoring, minimization and mitigation measures have been implemented.

8.15 Post-Termination Obligations

The Parties acknowledge that MidAmerican's compliance with the HCP will result in MidAmerican having fully mitigated for any incidental take of any Covered Species, provided that MidAmerican (a) has fully funded the Conservation Fund in accordance with the HCP and money in this fund has been spent or obligated for monitoring and off-site mitigation; or (b) has fully funded the Conservation Fund in accordance with the HCP, but money remains unspent or unobligated for monitoring and off-site mitigation, and take of Covered Species has not occurred as of the date of termination, relinquishment, or revocation.

In either case, if MidAmerican is in compliance with the terms of the HCP and ITP, including adequate mitigation for take up to the point of termination, relinquishment, or revocation of the ITP, then MidAmerican shall have no further obligations hereunder or under the ESA with regard to Covered Species or Permit Area upon termination, relinquishment or revocation. If MidAmerican has fully funded the Conservation Fund in accordance with the HCP, and take of Covered Species has occurred as of the date of termination, relinquishment, or revocation, then MidAmerican and the Service will coordinate to refund any remaining funds in accordance with Section 8.6.2.

8.16 Land Transactions

If MidAmerican acquires any additional Projects, MidAmerican may elect to include such Projects in the HCP and ITP in accordance with the Amendment Process. Upon such election, MidAmerican shall provide notice to the Service of its desire to include additional lands, along with a specific description of the location, legal description, and conditions of such additional property.

MidAmerican Energy may not sell or dispose of any Projects included in Covered Lands, or exchange any portion thereof, to any new party during the term of the HCP unless: (a) the HCP or ITP is modified to delete such lands in accordance with Section 8.14.2 (*Relinquishment*); or (b) the lands are transferred to a third-party who has agreed to be bound by the terms of the HCP, in accordance with Section 8.11 (*Permit Assignment and Transfer*).

9.0 <u>REFERENCES</u>

9.1 Glossary

Access roads: roads constructed or used for transportation of turbine parts or cranes and/or operation and maintenance vehicles.

Active period: The time when bats are not hibernating, defined for the Projects as April 1 to November 15

Activity: an element of work that is usually has an expected duration and outcome

Adaptive management: a structured, repeating process of optimal decision making by system monitoring, with an aim to reduce uncertainty over time

Alternative/Alternative Action: one of two or more mutually exclusive possible methods or options with potentially differing impacts; each alternative must be consistent with the Project's purpose, adhere to the agency's legal authority, avoid jeopardizing the continued existence of a species (in the agency's determination) and be both technically and economically feasible

Annual mortality: the number of casualties attributed to a wind facility or group of wind facilities per year

Anthropogenic: being human-caused or -created

Anticipated take: the potential projected numbers of individuals harmed, otherwise injured, or killed

Area adjustment factor: a mathematical correction factor based on empirical data from searched areas that is extrapolated to estimate mortality in unsearched areas

Arousal: the stage between hibernation and active states in hibernating animals, or a period where the animal awakes for a brief period of time before returning to a state of hibernation; arousal is typically characterized by an increased heart rate and body temperature

Authorized/Authorization Take: the level of Covered Species take authorized by the incidental take permit

Bald and Golden Eagle Protection Act (BGEPA): a federal act that provides protection for eagle species, including their nests, eggs, and parts, from take, possession, or commerce, excepting under certain specific conditions

Barotrauma: tissue damage to lungs caused by expansion of air that is not accommodated by exhalation, and that affects bats that fly in close proximity to spinning wind turbines

Bat activity: bats in active flight; in the case of acoustic detection studies, activity often refers to bat passes per detector night

Bat deterrent: a device that emits randomized and continuous ultrasonic noise that is intended to cause bats to avoid the area over which the acoustic sound is broadcast as a result of acoustical confusion

Bat pass: typically defined as continuous series of two or more call notes produced by an individual bat with no pauses between call notes of more than one second

Bias correction factors: mathematical correction factors based on empirical data from searcher efficiency and carcasses removal trials that are used to adjust mortality estimates to account for ineffective searches or carcass removal by scavengers

Bias: a systematic distortion of a statistic, or of data that are used to derive the statistic, due to sampling methods

Biological goal: the broad, guiding principles for an HCP and the rationale behind minimization and mitigation strategies.

Biological objective: the different components or measurable targets needed to achieve the biological goals of an HCP

Biological Opinion (BO): a document prepared by the USFWS that provides their determination as to whether the proposed action is likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of designated critical habitat

Bird and Bat Conservation Strategy (BBCS): a voluntary plan prepared by a wind power developer that outlines steps that will be taken to avoid, minimize, and mitigate impact to birds and bats.

Buffers/buffer zone: a zone or area surrounding a single turbine, a turbine string, or an entire wind energy facility that separates the area directly impacted by the turbine or facility from areas that are unlikely to be impacted

Candidate species: a species determined by the Service to be listed as a threatened or endangered species and that is supported by information on biological vulnerabilities or threats, but that is not currently listed as the action is precluded, or a species that is currently undergoing review by the Service and may potentially be listed as an endangered or threatened species

Canopy: the branches and foliage that form one or more layers near the top of the forest or of a single tree

Canopy cover: a measure of area covered by either the canopy of an individual plant or the area covered by many plants

Canopy height: the general height of a forest's canopy

Carcass availability: the number of carcasses that are placed and are available to be found during carcass removal trials

Carcass: the dead body of an animal

Cave bats (contrast tree bats): bat that hibernate and roost in caves or cave-like man-made structures

Changed Circumstances: changes in circumstances that are foreseeable and are likely to occur over the permit term of a given ITP

Climate change: long-term changes to the Earth's climate, particularly in reference to increasing atmospheric temperature attributed to greenhouse gasses

Collection cables/connector lines: cables that collect electricity from wind turbines and transport the electricity to the transformer at the substation

Collection system: the electrical system within the wind energy facility, including the turbines, the collector cables, and the transformer (contrast transmission system)

Collision: the strike of a bird or bat with a turbine structure, particularly with rotating blades

Commercial operation: activity that generates revenue for the commercial entity by manufacturing or producing a good or service that can be sold

Commuting path: the habitat an animal travels along periodically, such as during its daily or nightly activities, particularly where the animal habitually travels to and from foraging and resting areas

Compliance: adherence or conformance to a law, regulation, or policy

Compliance monitoring: a review or assessment of actions taken to determine if there was a conformance to the permit, regulation, policy, or law

Conservation benefit: an action that results in positive effects to a listed species, such as may result from reduction of fragmentation and increasing the connectivity of habitats, maintaining or increasing populations, insuring against catastrophic events, enhancing and restoring habitats, buffering protected areas, and creating areas for testing and implementing new conservation strategies

Covered Activity: an activity that has the potential to result in incidental take of a listed species that is covered by an ITP

Covered Species: the species addressed in this HCP

Covered Bat Species: a subset of the Covered Species, including INBA, NLEB, LBBA, and TRBA

Crane pad: a gravel pad approximately 20 m x 27 m (60 ft x 80 ft) extending from the roadway to the turbine foundation upon which the crane will operate during construction of the turbine

Crepuscular periods: dawn and dusk, particularly as a reference to when certain animals are active

Critical habitat: specific habitat or features that are essential or important to the conservations of a listed species and which may warrant special management considerations; areas legally designated as critical habitat by federal regulations

Critical outage: an outage of part of the facility (can be an individual turbine, substation, etc.) which requires more immediate attention.

Cryptic: having an ability to avoid detection or to effectively be concealed due to color, behavior, etc.

Cumulative impact: incremental impacts combined with the impacts of past, present, and reasonably foreseeable future actions

Curtailment: to reduce or decrease turbine operations to prevent production of electricity; methods include feathering turbine blades (see below) at a higher than normal wind speed (turbine cut-in speed) and turning turbines off for periods of time; during curtailment the owner/operator of the wind facility is voluntarily curtailing energy production in conditions it would otherwise be able to produce electricity

Cut-in speed: the wind speed at which turbines begin generating power to the electrical grid

Decommissioning: the dismantling and removal of all wind-power facilities, generally to a depth of at least 1.2 m (4.0 ft) below the surface, at the expiration or the termination of the landowner lease agreement, including the removal of access roads if required by the landowner, followed by restoration similar to its original condition

Degradation: the state of being reduced in quality or value

Designated critical habitat: habitat deemed to be critical to the conservation of a listed species and legally designated as such by federal regulation

Diameter at breast height (DBH): the diameter of a tree's trunk taken at a distance of approximately breast height (about 1.4 m [4.5 ft]) above the forest floor on the uphill side of the tree; used to calculate tree growth, among other metrics

Direct effects: the results of a proposed action that occur at the same time as the action

Dispersal: the movement of organisms away from their parent organisms and/or natal region

Displacement: when an animal is forced out of its normal range due to a disrupting influence, such as construction noise or vibration

Distribution line: electrical lines that lead from transmission lines to consumers

Disturbance: a change, usually transient, to environmental conditions and structures that produces a change in the ecosystem

Drought: an extended period of months or years during which a region experiences a deficiency in its water supply

Echolocation: the biological sonar used by several kinds of animals to locate and identify objects during navigation or foraging. Echolocating animals emit calls out to the environment and listen to the echoes of those calls that return from various objects near them.

Ecological trap: where organisms settle in poor-quality or less-optimal habitat due to changing environmental cues, particularly when the attractiveness of the habitat is not proportional to the value of the habitat for reproduction and survival

Economically feasible: Determining that something is economically achievable after conducting a cost/benefit analysis to determine the benefits and savings that are expected from a candidate system compared to the costs.

Ecosystem: an ecological community and its habitat

Ecoregion: a geographic region defined by its ecological aspects (e.g., as climate, vegetation, landforms, soil types, etc.)

Electrical grid: a vast, interconnected network for delivering electricity from suppliers to consumers. It consists of three main components: (1) generating plants that produce electricity from combustible fuels (coal, natural gas, biomass) or non-combustible fuels (wind, solar, nuclear, hydro power); (2) transmission lines that carry electricity from power plants to demand centers; and (3) transformers that reduce voltage so distribution lines carry power for final delivery.

Emergence: the period when bats leave hibernacula, usually from mid-April to the end of May

Endangered species (federal): any species, subspecies, or population that is in danger of becoming extinct in all or a significant portion of its range; danger of extinction may be due to a low population, being threatened by changing environmental parameters, and/or increased mortality due to disease, predation, or other impacts

Endangered Species Act (ESA): a federal act providing the means where endangered and threatened species, or the ecosystems upon which the species depend, may be conserved

Endangered Species Preservation Act: a federal act that authorized the Secretary of the Interior to list endangered species, allowed the Service to purchase habitat for endangered species, and instructed federal agencies to preserve the habitat of endangered species; no stipulation was made regarding the trade of endangered species or their parts; this act was the replaced by the Endangered Species Act

Environmental Impact Statement (EIS): an analysis required by NEPA that evaluates environmental risks for all major federal actions

Environmental impact: possible adverse effects caused by development or by changes made in the environment due to a project

Environmental tolerances: the ability of an organism to endure or otherwise weather adverse environmental conditions

Exfoliating bark: bark that is peeling, loose, or flaking, usually in thin layers

Exposure: the state of being at risk of harm, attack, or death

Extant: to be in existence or present

Fall migration period (bats): primarily from approximately the end of July to approximately mid-October

Fatality monitoring: conducting standardized searches to document bird and bat mortality at a project

Fatality: a death; a dead animal

Fatality rate: a measure of the number of deaths in a population over a given time period; see mortality

Feathering: when turbine blades are pitched (adjusting blade angles) parallel with the wind direction, causing them to only spin at very low rotation rates, if at all

Federal action: any activity entirely or partly financed, assisted, conducted, regulated, or approved by federal agencies; new or revised agency rules, regulations, plans, policies, or procedures; and legislative proposals

Federal agency: an administrative unit of the federal government

Federal Aviation Administration (FAA) lighting: lighting that is compliant with the Federal Aviation Administration's standards for marking and lighting structures to promote aviation safety

Federally endangered species: see Endangered species

Five-Point Policy: an addendum to the 1996 *Habitat Conservation Planning and Incidental Take Permit Processing Handbook* (USFWS and NMFS 1996) that describes five clarifying components that should be included in an HCP

Flight height: the height of a flying bird or bat above ground level

Flight path: the course a flying animal takes while flying

Flood: a natural event in stream systems where water temporarily covers land not normally covered by water, and that has both beneficial and detrimental effects on natural communities

Foraging habitat: the habitat used for foraging by an animal

Generating capacity: the amount of power a given electrical generation facility is capable of producing

Gestation: duration of or state of pregnancy in mammals

Global warming: see Climate change

Greenhouse gas: an atmospheric gas that is implicated in climate change and whose absorption of solar radiation is implicated in atmospheric warming; examples include carbon dioxide, ozone, fluorocarbons, and methane

Habitat: the living and non-living aspects of an organism's environs (e.g., air, water, topography, and other communities of animals and plants)

Habitat Conservation Plan (HCP)/conservation plan: a planning document that is a mandatory component of an application for an ITP that can be issued under Section 10 of the ESA

Habitat impact: adverse impact to an animal's habitat

Habitat need: a specific need that an animal has related to its habitat (e.g., bats that hibernate in caves can only winter in areas with appropriate caves)

"Harm": significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering (defined by the USFWS)

"Harass": actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering (defined by the USFWS)

Hibernaculum (plural, hibernacula): the physical structure (often a cave or mine in the case of bats) in which hibernating animals spend the winter

Hibernation habitat: habitat required for hibernation, e.g., undisturbed cave systems for bats

Hibernation: the act of spending the winter in a dormant condition, usually in some sort of shelter

Historical: having once existed in an area or having occurred in the past

Home range: the geographic area where an organism carries out its activities during all or part of the year

Impact: the result of an action or lack of action that affects a species or critical habitat, and may be a direct impact, an indirect impact, and/or a cumulative impact

Implementation Take: the level of take of the Covered Species at which mitigation will be implemented prior to any Adaptive Management response

Incidental take: take of any federally listed species that is incidental to an otherwise lawful activity(s) and is not the purpose of said activity(s)

Incidental Take Permit (ITP): a regulatory instrument that exempts a permittee from the prohibition of take under the ESA, if all conditions are met and the take is incidental to otherwise lawful activities

Indirect effects: effects that are caused by a proposed action at a later time, but are still reasonably certain to occur

Industry: refers to the production of an economic good or service within an economy

Infrastructure: the basic physical and organizational structures needed for the operation of a society or enterprise, or the services and facilities necessary for an economy to function

Invasive species: a non-native species that has been introduced to an ecosystem and whose introduction is causing or may cause economic or environmental harm

Inverse relationship: whereby one variable decreases as another variable increases in direct proportion

Issuance criteria: as outlined in the ESA, the standards and measures by which an ITP shall be issued if/when the criteria are met

Karst: irregular limestone geology that is characterized by fissures, caverns, and sinkholes caused by erosion

Lactation: milk production in mammals

Lawful activity: an action/activity consistent with federal, state, and local laws

Laydown area: an area within a project typically near turbine locations where turbine components are stored prior to construction

Life history: the natural changes an organism undergoes during its lifetime

Listed species (federal): a species, subspecies, or distinct population determined to be endangered or threatened under the federal ESA, and may also include candidate species for listing

Man-made structures (roosting): structures such as mines, abandoned houses, chimneys, and other structures that may be utilized by roosting bats

Maternity colony: where female bats congregate to birth and raise young and where pregnant and nursing bats assemble

Maternity habitat: habitat utilized by female bats that are raising young, including habitat for foraging and maternity roots

Maternity roost: habitat where female bats birth and raise their young, particularly for colonial bat species

Megawatt (MW): one million (1,000,000) watts

Meteorological (met) tower: typically a tubular or lattice tower with devices for measuring wind speed, wind direction, temperature, and with the devices set at more than one height

Methodology: procedures for collecting data

Microclimate: a localized climate in an area that may be as small as a few square feet and that differs from the surrounding climate in adjacent areas

Midwest Recovery Unit: the INBA recovery unit established by USFWS that includes the states of Indiana, Kentucky, Ohio, Tennessee, Alabama, and Michigan, and southwestern Virginia

Migrant: a migrating animal, particularly one currently exhibiting migration behavior

Migration: the process of moving from one region or climate, especially periodically and when triggered by environmental cues, or the act of migratory movement

Migratory bat: any species of bat that exhibits seasonal migratory behavior

Migratory Bird Treaty Act (MBTA): a federal act that prohibits the take of migratory birds, including any part, nest, or eggs of these birds

Migratory bird: any species of bird that exhibits seasonal migratory behavior

Minimization measures: measures to reduce the chance of take of listed species, including operational restrictions during the period when bats are expected to be in the Project area

Mist-netting study/survey: a study conducted using mist-nets to determine presence or probably absence of certain bat species

Mitigated take: the amount of take for which the impacts of the taking have been met through mitigation projects

Mitigation measures: measures or activities that are to moderate, reduce, or alleviate impacts, or to somehow provide compensation for impacts

Mitigation true-up: providing additional funding for mitigation projects in response to adaptive management to insure that the amount of mitigation implemented continues to offset the impacts of the taking for the estimated take

Monitoring and remediation period: the period where the project and actions are analyzed to compare performance to anticipated results and to make necessary corrections if necessary

Morphology: the form and structure of an organism or its parts

Mortality: a measure of the number of deaths in a population over a given time period (e.g. a year); fatality rate

Myotid: of or relating to bats belonging to the genus *Myotis*

Myotis bats: bats of the genus *Myotis*, or informally, “mouse-eared” bats

Nacelle: the portion of the turbine that houses the generator and brake assembly

National Environmental Policy Act (NEPA): a federal act that requires federal agencies to examine environmental impacts of their actions and provide for public participation

Native: an organism that is normally found in and thrives in a specific ecosystem, particularly those organisms that developed or evolved with the habitat or ecosystem

Natural drainages: the natural removal of surface and sub-surface water from an area

Negative impact: an adverse impact, or a detrimental effect to the desired outcome or the baseline state

Neonatal survival: survival of newborns

No Surprises Assurance/No Surprises Rule: provides an HCP applicant with regulatory certainty and calls for the Services to assist with correcting any unforeseen circumstance that may arise. This means that in the face of Unforeseen Circumstances, the USFWS and NMFS will not require additional mitigation in the form of additional lands or funds from any permittee who is adequately implementing or has implemented an approved HCP. The policy also protects the permittee from other forms of additional mitigation except in cases where "extraordinary circumstances" exist.

Noxious weeds: an undesirable and often invasive plant, particularly one that can directly or indirectly harm crops, livestock, the environment, or other natural resources

Operating life: the period over which a wind power project is commercially operational

Operation: the state of a wind power facility when its turbines are rotating and producing power that is transmitted to the electrical grid

Operations and maintenance (O&M) building: a building where equipment, supplies, and staff necessary for the successful operation of a wind power facility are located

Ozark-Central Recovery Unit (OCRU): the INBA recovery established by USFWS unit that includes the states of Iowa, Illinois, Missouri, Arkansas, and Oklahoma

Permit Area: a subsection of the Plan Area that consists of all areas where incidental take of the Covered Species is expected to occur and which will be authorized by the ITP

Phenology: the study of relations between climate and periodic biological phenomena (e.g., the annual timing of bird migration or plant flowering)

Philopatric: the act or tendency of an animal or species to stay in a particular region of the animal's birth; for bats, this includes using the same areas and same roosts in successive years

Physiographic regions: broad-scale subdivisions based on terrain texture, rock type, and geologic structure and history

Pitch: the angle of the rotor or blade to the wind

Plan Area: the geographic area where all activities included in the HCP will occur. It includes any and all areas that may be within the HCP's sphere of influence, whether or not take is likely to occur in those areas.

Population demographics: statistical characteristics of a population, such as birth rate and death rate

Post-construction monitoring: monitoring at a wind power facility that consists of searchers looking for bird and bat fatalities

Potential take: the chance that situations or conditions may result in harm or death of an individual

Precipitation: moisture formed by condensation of water vapor in the atmosphere (e.g., rain, dew, and snow)

Predation: the act of capturing and feeding upon an animal

Priority 1 hibernacula: hibernacula essential to the recovery and long-term conservation of the species and have a current or historically observed winter population of 10,000 or more individual bats

Priority 2 hibernacula: hibernacula that contribute to the recovery and long-term conservation of the species and have a current or historical population of more than 1,000 but less than 10,000 individual bats

Priority 3 hibernacula: hibernacula that have a current or historical population of 50 to 1,000 individual bats

Priority 4 hibernacula: hibernacula that have a current or historical population of fewer than 50 individual bats

Priority recovery action: actions that have been identified in the recovery plan as being the most important for recovery of the INBA population

Project(s): a wind energy facility(s) located in the State of Iowa and owned and operated by MidAmerican Energy

Project area(s): the leased land of each Project or Projects

Pseudogymnoascus destructans: a psychrophilic fungus found on the exposed tissues (wings, faces, ears, and muzzles) of bats afflicted with white-nose syndrome; the causative agent of WNS in bats

Psychrophilic: an organism, especially a bacterium or fungus that engages in optimal growth at lower temperatures

Pup season: June 1 to July 31, as defined for NLEBs (USFWS 2016d), but also applicable to the other Covered Bat Species; a time during which maternity roosts are occupied and may contain immobile young

Purpose and Need: the reasons a project or activity is being implemented

Radio tracking: see telemetry

Range: the geographic area where a population of organisms carries out its activities during all of part of the year

Recovery unit: geographic units in which recovery actions are focused that are based on a combination of preliminary evidence of population discreteness and genetic differentiation, differences in population trends, and broad-level differences in macrohabitats and land use. Recovery units serve to protect both core and peripheral populations and ensure that the principles of representation, redundancy, and resiliency are incorporated

Recovery: restoration of a population of federally listed species to self-sustaining levels; criteria for reclassification and delisting are specified in species Recovery Plans

Recruitment rate: generally defined as the number of young added to the population in the fall from that year's breeding effort (i.e., the population increase after that year's natality and mortality have been accounted for)

Recruitment: the addition of young, particularly of a given age, which are added to the population as a result of past breeding effort (e.g., juvenile recruitment, sub-adult recruitment, and young adult recruitment)

Regime: a natural, periodic event, typically on a landscape scale (wind, flood, fire, drought, etc.)

Regional migrant species (bats): bats species that migrate moderate distances, between 100 to 500 km (60 to 310 miles) between summer and winter roosts

Regulations: administrative rules and procedures that establish or constrain rights and allocate responsibilities

Remediation: the action of remedying something, especially the reversal or stopping of damage to the environment

Remote operations center (with regard to a wind power facility): a remotely located center (i.e., off-site from the wind facility) where real-time monitoring of the operations and performance of the wind farm is conducted and established procedures are applied in order to guarantee maximum availability, sale of energy, and wind farm service

Removal trials: controlled trials conducted during post-construction mortality monitoring at a wind power facility that use sample carcasses to determine the average length of time carcasses persist before being removed (e.g., consumed or carried off by a scavenger)

Renewable energy: energy generated from naturally replenished resources, such as sunlight, tides, wind, and geothermic heat

Reproductive capacity: the relative ability of a species to reproduce itself under optimal conditions

Reproductive potential: a population's maximum reproductive output if it had no limitations; if all essential factors, such as food, space, shelter, mates, etc. were readily available

Restoration: practice of renewing and restoring degraded, damaged, or destroyed ecosystems and habitats in the environment by active human intervention and action, within a short time frame

Restoration actions: tree planting, girdling of existing trees of sufficient DBH, and clearing of understory vegetation

Risk: the possibility or probability of injury or fatality occurring to an individual or a population

Roost: a place where bats rest, shelter, and/or sleep

Roost trees: trees used as roots by bats, especially during the summer; typically, the roost trees will have loose bark or crevices for the bats to shelter in or under

Rotor: the blades of a wind turbine, collectively

Rotor-swept height: the area that is swept by the blades when the rotor is turning, with the lower limit of the being the height from the ground to the tip of the blade at the 6 o'clock position, and the upper limit being the height from the ground to the tip of the blade at the 12 o'clock position

Scavenger: an animal that feeds on carrion (e.g., carcasses)

Scavenger removal: the removal of a carcass by a scavenger feeding on the carcass or the carrying away of said carcass by a scavenger

Scientific understanding: knowledge derived from scientific investigations

Search plot: a designated area of a specific size and shape at the base of a turbine in which fatality searches are conducted during post-construction mortality monitoring at a wind power facility

Searchable area adjustment: a mathematical adjustment based on empirical data from searched areas that is extrapolated to estimate mortality in areas that could not be searched due to topography, vegetation, safety or other issues

Searcher efficiency trials: controlled trials conducted during post-construction mortality monitoring at a wind power facility that use sample carcasses to determine the effectiveness of searchers in finding carcasses or casualties

Sedentary species (bats): bat species that breed and hibernate in the same local areas and usually move less than 50 km (30 miles) between summer and winter roosts

Solar exposure: how much solar energy or solar radiation a roost is exposed to

Spring migration season (bats): primarily from approximately the first of April to approximately late-May

Stacking mitigation: when one mitigation project benefits more than one Covered Species

Stochasticity: the state of lacking any predictable order

Substation: a power station where electrical power is converted (e.g., from direct current to alternative current power)

Summer habitat: habitat utilized by summering animals

Summer range: where a species may be found in the summer

Summering: for an animal to spend the summer in a particular locale

Supervisory Control and Data Acquisitions (SCADA) system: generally refers to industrial control systems, or computer systems that monitor and control industrial, infrastructure, or facility-based processes

Surface disturbance: disturbance of habitat at the ground surface, such as grading of roads

Survival rate: indicating the percentage of animals that are alive after a given event that has the potential to harm or kill members of the population, such as disease

Swarming behavior: behavior exhibited by mating bats in the fall at the entrances of hibernacula whereby large numbers of bats fly in and out of the cave entrances from dusk to dawn, but relatively few bats roost inside the cave during the day

Swarming period: the period from late summer and early fall where bats return to the vicinity of a hibernaculum and exhibit mating behavior; the period when mating occurs; swarming typically refers to the act of many bats flying in and around the entrance of hibernacula

Take (BGEPA): to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb eagles

Take (ESA): to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct

Take compliance: to comply with the terms of an Incidental Take Permit

Take limit: a specified number of individuals or acres of habitat that may be incidentally taken according to the terms and conditions of an Incidental Take Permit

Technical Review Team: Team made up of MidAmerican Energy, USFWS, IDNR, and INHF personnel who are responsible for review and selection of mitigation projects

Telemetry: the tracking of an animal by radio waves emitted from a device attached to the animal's body

Temporary impact: an impact that is expected to be of a limited duration

Thermoregulation: regulation of body temperature

Thermoregulatory costs: the energetic expenditure of thermoregulation

Threat: something or some aspect that may cause injury or death to a species of interest or to an individual

Threatened species (federal): a species or population that is vulnerable to becoming endangered in the near future

Topography: the description or representation of geographic surface features, especially in regards to location and elevation

Torpor: dormancy in a hibernating or estivating animal

Tower: the cylindrical portion of a wind turbine generator to which the nacelle and rotor are attached

Transmission system: the electrical system outside the wind energy facility that includes the transmission lines (contrast collection system)

Travel corridor: a pathway used by animals to travel from one habitat to another

Tree bats (contrast cave bats): any of the bat that typically roost in trees and that usually migrate to warmer climates and may not hibernate

Trigger: a specific action or set of conditions that invoke a response

Turbine foundation: A steel base plate or concrete foundation that is necessary to adequately support a tower, nacelle and rotor

Turbine maintenance: activities for the repair and maintenance of the turbine itself and the associated infrastructure (e.g., roads, collection system, road surfaces and culverts), including mowing activities and building inspections and repairs

Turbine pad: flat, well graded and compacted areas constructed of crushed rock at the base of the wind turbine

Unavoidable take: harm or death of listed species that cannot be avoided as a result of otherwise lawful activities

Unforeseen Circumstances: changes in circumstances that are not expected or foreseen to occur over the permit term of a given HCP

Volant: having the ability to fly

White-nose syndrome (WNS): a disease in bats characterized with high fatality rates (from 30 to 99% mortality) in bats, and associated with the presence of the fungus *Pseudogymnoascus destructans*, particularly on the exposed tissues (e.g., muzzles, faces, ears, and wings) of affected bats, and where infected bats exhibit aberrant behavior (such as chronic arousals) leading to loss of winter fat stores, pneumonia, starvation, and the disruption of hibernation and feeding cycles

Wildlife Incident Reporting System: a specific set of processes, procedures and training for monitoring, responding to, and reporting bird or bat injuries and fatalities at a wind power facility

Wind energy/wind power: renewable energy generated by wind turbines at a wind energy facility

Wind facility/wind farm: the turbines and associated structures and infrastructure that produce electricity from wind

Wind turbine/wind turbine generator(s)/turbine(s): a device that converts kinetic energy from the wind into mechanical energy

Winter census/winter survey: a census of a population performed during the winter; for bats, a census of the hibernating populations

Winter range: where a species may be found in the winter

Wintering: for an animal to spend the winter in a particular locale

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